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For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Sixteen-Inch "Fox" Monitor Lathe.

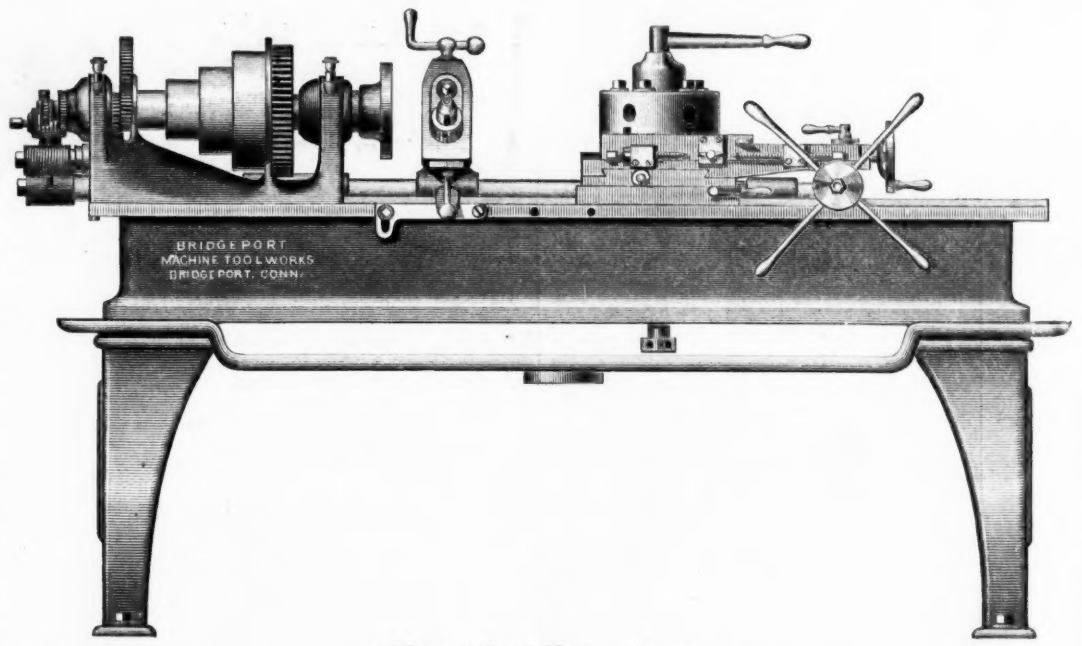
This machine shown in the engraving, is one just brought out by E. P. Bullard, 14 Dey street, New York, manufactured at the Bridgeport (Conn.) Machine Tool Works. It swings 16 inches, and is a heavy substantial tool of its class, well arranged for quick work on all ordinary kinds of brass goods.

The turret slide is arranged to be quickly moved by the pilot wheel through a rack and pinion or to receive slow motion through a screw operated by the hand-wheel shown at the end; a touch of the binder handle is all that is necessary to change from motion by the pilot wheel to motion by the screw, or *vice versa*.

The slides, lateral and cross, are fitted with taper gibs with screw adjustment, making solid and reliable bearing surfaces. The turret has holes for six tools.

The pan shown below extends entirely underneath the bed, and projects some distance on each side, being very convenient for catching chips, etc.

The guide bar at the back is unusually heavy, and the bed and other parts are well proportioned and stiff. The arrangement for taper is convenient for use.



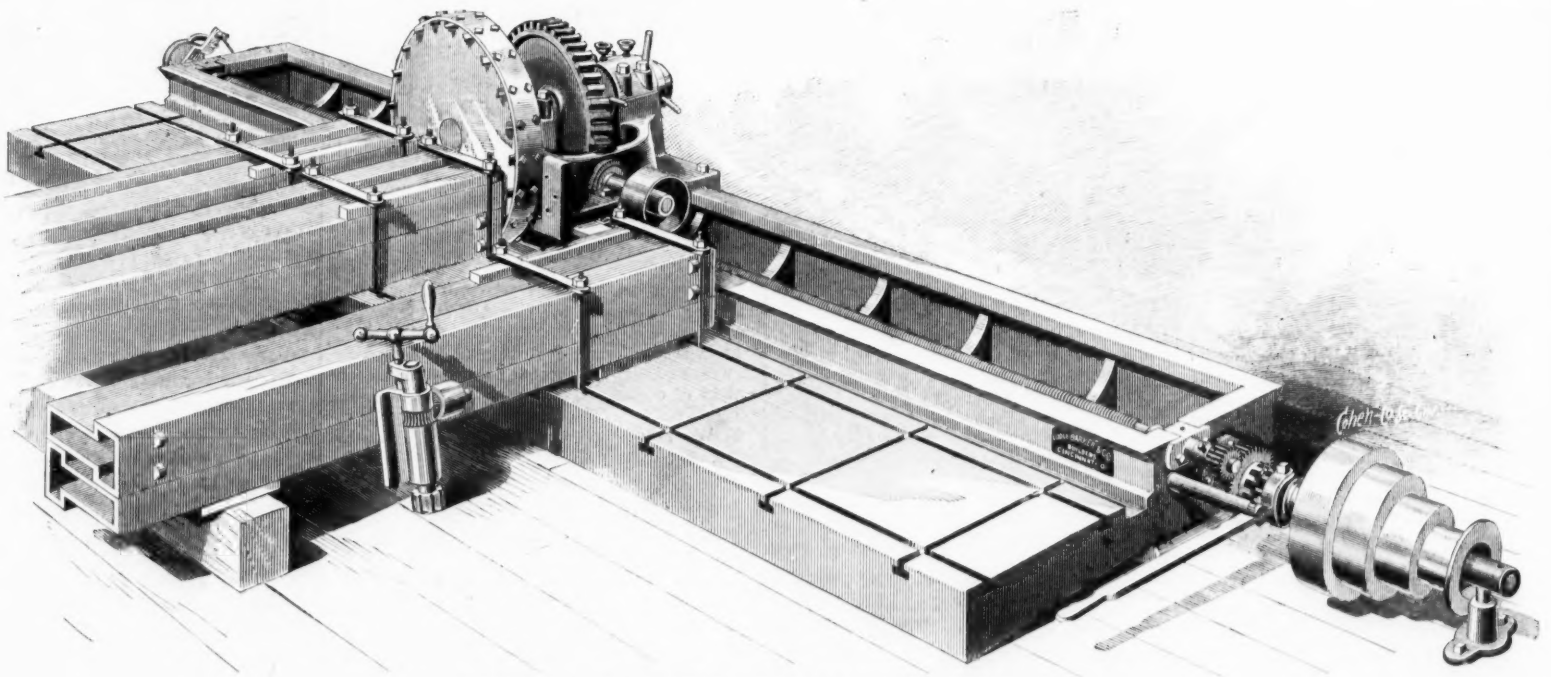
16-INCH "FOX" MONITOR LATHE.

Thirty-six-Inch Rotary Planer or Column Facing Machine.

This machine is designed for doing rapid work in facing the ends of columns for architectural iron work, bridge beams, and a large variety of other work. It is made in two sizes—36-inch and 48-inch—and in lengths to suit the purchaser. As will be readily seen from the cut, the advantage of a long bed is, that it enables the operator while cutting one piece of work to place another in position; this may be repeatedly done until the end of travel is reached, and as the cutter-head leaves the work which is done, the operator may also take this away and clamp other work in position for the next cut. This keeps the machine constantly at work.

An attachment, as shown in cut, is also made for the purpose of milling the inside faces of such columns lengthwise as may be required to be jointed. This attachment is fastened to the right of the large cutter-head, and is operated by a worm and worm wheel, and is intended to cut parallel with the top of table.

This machine is made by Lodge, Barker & Co., Cincinnati, Ohio.



THIRTY-SIX-INCH ROTARY PLANER OR COLUMN FACING MACHINE.

Chicago Division No. 111, of the Brotherhood of Locomotive Engineers, is making a collection of railway appliances and historical works pertaining to locomotive management, for exhibition in its hall and the instruction of its members. The hall will be fitted up with suitable shelving, and each article properly labeled. The division solicits donations of working models or manufactured articles (sectional views preferred). Communications should be addressed to T. R. Freeman, C. R. I. and P. Railway's Round House, Chicago.

From the statement of the Chief of the Bureau of Statistics it is seen that for the year ending June 30, 1885, the total number of immigrants to this country was 387,821. This is 120,013 fewer than last year, and less than half the number arriving for the year ending June 30, 1882.

The American Association for the Advancement of Science will hold its thirty-fourth meeting at Ann Arbor, Mich., on August 26th. We are not fully informed of the subjects for discussion.

Modern Locomotive Construction.

BY J. G. A. MEYER.

FIFTH PAPER.

TRACTIVE POWER—CONTINUED.

Dividing the units of energy the cylinders are capable of exerting by the circumference of the wheel, we have

$$\frac{47076.876}{11.78} = 3996^{*} \text{ pounds.}$$

The tractive power of the engine is, therefore, capable of lifting a weight of 3996 pounds attached to the driving wheel, as shown in Fig. 8; or, in other words, the tractive power of this engine is capable of overcoming a train resistance of 3996 pounds. In a similar manner, the tractive power of any engine may be found, namely, by multiplying together twice the area in square inches of one piston, the mean effective steam pressure per square inch, and twice the length of the stroke in feet; then dividing this product by the circumference in feet of the wheel, the quotient will be the tractive power of the engine.

This rule can be greatly simplified, as we shall presently show. The tractive power and the adhesion are represented by the same number of pounds; therefore, multiplying the tractive power by 5, we have $3996 \times 5 = 19980$ pounds, which is the weight that must be placed on the drivers of this particular engine. Our answer, then, to Example 5, is: Tractive power, 3996 pounds; weight on drivers, 19980 pounds.

In Example 4 it has been shown how to find the diameters of the cylinders when the weight on the drivers and the diameters of

* This answer would have been 4000, instead of 3996, if the decimal fraction in the 3.33 feet (obtained by multiplying the stroke by 2) had been exact.

the same are known; and in Example 5 it has been shown how to find the weight on the drivers when the dimensions of the cylinders and diameters of driving wheels are known. From the reasoning connected with these examples, we conclude that the tractive power should not be more or less than the adhesion—a fact which we have stated before. We may also reasonably conclude that, when the dimensions of the cylinders and the diameters of the driving wheels of any engine are given, also the mean effective steam pressure per square inch of piston, which we have assumed to be always 90 pounds, we may at once arrange, for future use and reference, a table for each class of engine, showing the tractive power of each, the necessary weight on the drivers, and the number of tons of 2,000 pounds that each engine can haul on a straight and level track. Indeed, we may extend these tables so that the weight on the truck, and consequently the total weight of each engine, will at once be seen.

With these objects in view, the following tables have been prepared. In these tables, columns 1 and 2 are exactly the same as those given in tables 1, 2, 3 and 4. In column 3 of all the following tables the adhesion is given and, since the adhesion and tractive power are expressed by the same number of pounds, these figures are obtained by finding the tractive power of each engine, and for this purpose always using the small diameter of driving wheels given in column 2. The weight on drivers is shown in column 4, which is obtained by multiplying the adhesion by 5 for all classes of engines. Column 5 gives the weights on the trucks, and these are based upon observations. Thus, it has been noticed that the weight on the truck for an eight-wheeled engine is about one-half of that placed on the drivers; hence, multiplying the weight placed on drivers by the decimal .5, the weight on the truck will be known.

For Mogul engines, we multiply the total weight on drivers by the decimal .2, and the product will be the weight on the truck.

For ten-wheeled engines, the total weight on the drivers, multiplied by the decimal .32, will be equal to the weight on the truck.

And lastly, for consolidation engines, the total weight on drivers, multiplied by the decimal .16, will determine the weight on the truck.

For instance, to find the weight on the truck for an eight-wheeled engine, with cylinders $17'' \times 24''$, we multiply the total weight on drivers for this engine, given in column 4, by .5; hence, we have $52020 \times .5 = 26010$ pounds equal weight on truck.

For a $17 \times 24''$ Mogul engine, we have—

$63697 \times .2 = 12739$ pounds = weight on truck.

For an $18 \times 24''$ ten-wheeled engine, we have—

$68611 \times .32 = 21955$ pounds = weight on truck.

And for a $20 \times 24''$ consolidation engine, we have—

$90000 \times .16 = 14400$ pounds = weight on truck.

In column 6, the total weight of each engine is given, which is obtained by adding the weight on the drivers to the weight on the truck. Dividing the adhesion given in column 1 by $7\frac{1}{2}$ will give us the number of tons of 2,000 pounds that the engine is capable of hauling on a straight and level track; these figures are given in column 7.

The weight of engines given in these tables will be found to agree generally very closely with the actual weights of locomotives recently built, although it must not be expected that these weights will agree in every case with the actual weights, because the different builders do not build the engines alike.

The given weights on the trucks for Mogul or consolidation engines may differ considerably from the actual weights, yet this should not be a matter of surprise, because the weight on a truck for either of these engines can be changed without changing the total weight of engine, and, indeed, often the pieces of mechanism connecting the truck to the engines are so arranged that a heavy or light weight can be thrown on the truck while the engine is standing on the track.

Yet the figures in these tables, indicating the weights on the trucks, can be safely taken as guides in constructing and proportioning an engine.

The actual weight on trucks for eight-wheeled or ten-wheeled engines will not differ much from those given in the tables, because these weights depend greatly on the difference between the total and rigid wheel base, and these are not often changed by the different builders. The proportion between the rigid and total wheel base is generally the same.

It has already been stated that the rule (as before given) for finding the tractive power of an engine can be greatly simplified. To explain this, we will again state the former rule, but, instead of writing it in the ordinary language, we will employ a number of simple arithmetical signs. This will enable us to bring the whole mode of operation under the eye, and follow it without taxing our memory; hence this rule will read as the following:

Rule A.

$$\frac{\left\{\begin{matrix}\text{Area of piston}\\ \text{in inches}\end{matrix}\right\} \times \left\{\begin{matrix}\text{Mean effective steam}\\ \text{pressure per sq. inch}\end{matrix}\right\} \times \left\{\begin{matrix}\text{stroke}\\ \text{in feet}\end{matrix}\right\} \times 2 \times 2}{\text{Circumference of wheel in feet}} = \text{tractive power.}$$

For the sake of distinction, we have called this Rule A. Now, remembering that the area of a piston is found in multiplying the square of its diameter by .7854, and also that the circumference of a wheel is found by multiplying its diameter by 3 1416, we can put in the place of "*area of piston in square inches*," in Rule A, the method of finding this area, namely, square of diameter in inches $\times$ .7854; and, in the place of "*circumference of wheel in feet*," we may put diameter of wheel in feet $\times$ 3 1416; consequently, the wording of the Rule A will be changed, and read like rule B:

Rule B.

$$\frac{\left\{\begin{matrix}\text{Square of diam.}\\ \text{of piston in}\\ \text{inches} \times .7854\end{matrix}\right\} \times \left\{\begin{matrix}\text{Mean effective steam}\\ \text{pressure per sq. inch}\end{matrix}\right\} \times \left\{\begin{matrix}\text{Stroke}\\ \text{in feet}\end{matrix}\right\} \times 2 \times 2}{\text{Diameter of wheel in feet} \times 3.1416} = \text{tractive power.}$$

If, now, we multiply the decimal .7854 by 2, and again by 2 (figures which are found above the line in Rule B), we have a product of 3.1416. Below the line, in Rule B, we find the same figure—that is, 3.1416; hence, we may cancel all these figures, or, in other words, we may throw out of the Rule B the decimal .7854 and the figures 2×2, all found above the line, and the figure 3.1416, which is found below the line. Doing so, the wording of the Rule B will be changed to that of

Rule 3.

$$\frac{\left\{\begin{matrix}\text{Square of the dia.}\\ \text{of piston in inches}\end{matrix}\right\} \times \left\{\begin{matrix}\text{Mean effective steam}\\ \text{pressure per sq. inch}\end{matrix}\right\} \times \left\{\begin{matrix}\text{stroke}\\ \text{in feet}\end{matrix}\right\}}{\text{Diameter of wheel in feet}} = \text{tractive power.}$$

In ordinary language, Rule 3 would read: Multiply together the square* of the diameter in inches of one piston, the mean effective steam pressure per square inch and the length in feet of one stroke. The product thus obtained, divided by the diameter in feet of one wheel, will be the tractive power.

EXAMPLE 6.—What is the tractive power of a locomotive whose cylinders are 17 inches in diameter and 24 inches stroke? The mean effective steam pressure is 90 pounds per square inch, and the driving wheels 60 inches in diameter. $\frac{17 \times 17 \times 90 \times 24}{60}$ = 10404 = tractive power. If the tractive power had been calculated according to Rule A, the result would have been the same. But Rule 3 is the best to use, because with it a great amount of time and labor will be saved. Indeed, Rule 3 is nothing else but Rule A made very much simpler.

All the figures expressing the adhesion in pounds, as shown in column 3 in all the following tables, have been found according to Rule 3:

*By square of the diameter is meant the result obtained by taking the diameter twice as a factor, or we may say it is the product of the diameter multiplied by a figure equal to the diameter; thus, let the diameter be 17 inches, then the square of this diameter is equal to $17 \times 17 = 289$.

TABLE 5

EIGHT-WHEELED LOCOMOTIVES.

Cylinders. Diameter. Stroke.	Diameter of driving wheels.	Adhesion.	Weight on drivers.	Weight on truck.	Total weight.	Hauling capacity on level track in tons of 2,000 pounds, including tender.
Col. 1.	Col. 2.	Col. 3.	Col. 4.	Col. 5.	Col. 6.	Col. 7.
Inches.	Inches.	Lbs.	Lbs.	Lbs.	Lbs.	
10 x 20	45 to 51	4000	20000	10000	30000	533
11 x 22	45 to 51	5324	26620	13310	39930	709
12 x 22	48 to 54	5940	29700	14850	44550	792
13 x 22	49 to 57	6828	34140	17070	51210	910
14 x 24	55 to 61	7697	38485	19242	57727	1026
15 x 24	55 to 66	8836	44180	22090	66270	1178
16 x 24	58 to 66	9533	47665	23832	71497	1271
17 x 24	60 to 66	10404	52020	26010	78030	1387
18 x 24	61 to 66	11472	57360	28680	86040	1529

Figures in columns 1 and 2 are the same as those in Table 1.

Figures in column 3 are obtained according to Rule 3.

Figures in column 4 are obtained by multiplying the figures in column 3 by 5.

Figures in column 5 are obtained by multiplying the figures in column 4 by .5.

Figures in column 6 are obtained by adding the figures in column 4 to those in column 5, and are the weight of engine in working order with water and fuel.

Figures in column 7 are obtained by dividing the figures in column 3 by $7\frac{1}{2}$.

TABLE 6.

MOGUL ENGINES

Cylinders. Diameter. Stroke.	Diameter of driving wheels.	Adhesion.	Weight on drivers.	Weight on trucks.	Total weight.	Hauling capacity on level track in tons of 2,000 pounds, including tender.
Col. 1.	Col. 2.	Col. 3.	Col. 4.	Col. 5.	Col. 6.	Col. 7.
Inches.	Inches.	Lbs.	Lbs.	Lbs.	Lbs.	
11 x 16	35 to 40	4978.2	24891	4978	29869	663
12 x 18	36 to 41	6480	32400	6480	38880	864
13 x 18	37 to 42	7399.4	36997	7399	44396	986
14 x 20	39 to 43	9046	45230	9046	54276	1206
15 x 22	42 to 47	10607	53035	10607	63642	1414
16 x 24	45 to 51	12288	61440	12288	73738	1638
17 x 24	49 to 54	12739.5	63697	12739	76436	1698
18 x 24	51 to 56	13722.3	68611	13722	82333	1829
19 x 24	54 to 60	14440	72200	14440	86640	1925

Figures in columns 1 and 2 are the same as those in Table 2.

Figures in column 3 are obtained according to Rule 3.

Figures in column 4 are obtained by multiplying the figures in column 3 by 5.

Figures in column 5 are obtained by multiplying the figures in column 4 by .2.

Figures in column 6 are obtained by adding the figures in column 4 to those in column 5, and are the weight of engine in working order with water and fuel.

Figures in column 7 are obtained by dividing the figures in column 3 by $7\frac{1}{2}$.

TABLE 7.

TEN-WHEELED ENGINES.

Cylinders. Diameter. Stroke.	Diameter of driving wheels.	Adhesion.	Weight on drivers.	Weight on truck.	Total weight, with water and fuel.	Hauling capacity on level track in tons of 2,000 pounds, including tender.
Col. 1.	Col. 2.	Col. 3.	Col. 4.	Col. 5.	Col. 6.	Col. 7.
Inches.	Inches.	Lbs.	Lbs.	Lbs.	Lbs.	
12 x 18	39 to 43	5981.5	29907	9570	39477	797
13 x 18	41 to 45	6677.5	33387	10683	44070	890
14 x 20	43 to 47	8204.6	41023	13127	54150	1083
15 x 22	45 to 50	9900	49500	15840	65340	1320
16 x 24	48 to 54	11520	57600	18432	76032	1536
17 x 24	51 to 56	12240	61200	19584	80784	1632
18 x 24	51 to 56	13722.3	68611	21955	90566	1829
19 x 24	54 to 60	14440	72200	23104	95304	1925

Figures in columns 1 and 2 are the same as those in Table 3.

Figures in column 3 are obtained according to Rule 3.

Figures in column 4 are obtained by multiplying the figures in column 3 by 5.

Figures in column 5 are obtained by multiplying the figures in column 4 by .32.

Figures in column 6 are obtained by adding the figures in column 4 to those in column 5, and are the weight of engine in working order with water and fuel.

Figures in column 7 are obtained by dividing the figures in column 3 by $7\frac{1}{2}$.

TABLE 8.

CONSOLIDATION ENGINES.

Cylinders. Diameter. Stroke.	Diameter of driving wheels.	Adhesion.	Weight on drivers.	Weight on truck.	Total weight, with water and fuel.	Hauling capacity on level track in tons of 2,000 pounds, including tender.
Col. 1.	Col. 2.	Col. 3.	Col. 4.	Col. 5.	Col. 6.	Col. 7.
Inches.	Inches.	Lbs.	Lbs.	Lbs.	Lbs.	
14 x 16	36 to 38	7840	39200	6272	45472	1045
15 x 18	36 to 38	10125	50625	8100	58725	1350
20 x 24	48 to 50	18000	90000	14400	104400	2400
22 x 24	50 to 52	20908.8	104544	16727	121271	2787

Figures in columns 1 and 2 are the same as those in Table 4.

Figures in column 3 are obtained according to Rule 3.

Figures in column 4 are obtained by multiplying the figures in column 3 by 5.

Figures in column 5 are obtained by multiplying the figures in column 4 by .16.

Figures in column 6 are obtained by adding the figures in column 4 to those in column 5, and are the weight of engine in working order with water and fuel.

Figures in column 7 are obtained by dividing the figures in column 3 by $7\frac{1}{2}$.

An Ingenious and Useful Invention.

A patent has been issued to a gentleman of Gallipolis, O., for a pair of scales which announce, with unerring correctness, the value of any number of tons, pounds or ounces at any price. For instance, a ham is placed on the scales, its weight is $12\frac{3}{4}$ pounds, and the price is $12\frac{1}{2}$ cents per pound. A sliding weight is moved along the scale beam until it balances the ham. In the notch where this weight stops will be found the worth of the meat in dollars and cents to a fraction. Again, suppose a child comes to the grocery for 50 cents worth of tea that is selling at 78 cents per pound. One indicator is set at 50 and the other at 78. The tea is poured into the scoop until the scales balance, when the amount is found to be as correct as if several minutes of valuable time had been employed to weigh it and figure out the price in the old way. The invention can be applied to druggists' scales, stock or letter scales, and will, doubtless, cause a revolution in the scale business generally. The inventor is Mr. Jules Pitrat, a cultivated gentleman of French descent, who has been an invalid for several years, and who worked out the problem after months of hard study and experiment. A gentleman of this city who saw the first model at work, a few days ago, describes it as perfectly wonderful in its operation, and yet so simple in action that a child can learn to use it in a few moments.—*Shipping and Commercial List.*

An increasing number of people are using chilled tools for metal-cutting machines. One firm engaged in turning large forgings of steel in the manufacture of guns will only use chilled tools. In addition to the cost of good tool steel, there is the waste connected with it. Good tool steel cannot be bought now at less than 9d. per lb., and, as a rule, only one-half of it is consumed. There is always a piece at the last unused. Then, by the time that the tool steel has been heated and forged over and over again, its qualities are destroyed, and it reaches a period when it is hardly worth being used at all. Cast-iron tools can be made at 1d. per lb., and when chill is worn off can be re-melted into new tools. The principal thing to keep in view in preparing chilled tools is to have a large chill so as to get the iron thoroughly hard.—*The Engineer and Iron Trades' Advertiser.*

New Steam Pumps.

We herewith illustrate three pumps from new patterns, made by Dean Brothers' Steam Pump Works, Indianapolis, Ind.

The duplex pump and its valve motion are familiar to mechanics. Two direct-acting pumps are placed side by side, and so connected that the valve motion of each is moved by its companion. The duplex steam pump here shown is intended for fire protection or water supply. It is neat in form and the parts are heavy.

The single direct-acting pump is also for fire protection or water supply. The steam valve mechanism is a recent invention. This valve gear is said to be practically noiseless, even when working at a high speed.

The automatic air pump is intended for compressing air for use in breweries, where the air is conveyed to casks in cellar, and by it beer is forced through hose from cellar to cellar. Acids that would attack the metal of a pump can be moved in the same way, without passing through the pump. The pump can be used for agitating a liquid by forcing air through it. It can also be used for cooling liquids by forcing artificially-chilled air through them. The regulator is automatic, maintaining a uniform air pressure. The air acts on a piston so as to close or open the steam throttle valve as the pressure increases or diminishes. The pressure can be changed by putting on or taking off the weights, which are suspended from the regulator lever.

The Kunstadter Steering and Propelling Screw.

Last winter the Secretary of the Navy appointed a board of engineers to test this device on the U. S. S. Nina. The test was made with this device and with the rudder alone. With the rudder alone, and at an angle of 45 degrees, the vessel was turned in a circle, the diameter of which was 521½ feet, while with the Kunstadter device the turning was done in a circle of a trifle more than 314 feet. The time occupied in turning in the two instances was directly proportioned to the diameter of the respective circles described. It should be noted that the rudder which was used alone was of excessively large dimensions; it is probable that with ordinary proportions of rudder the Kunstadter apparatus would enable a vessel to turn on a circle one-half the diameter that could be accomplished with the rudder alone, either going ahead or astern. At other angles than 45 degrees the new apparatus demonstrated its superiority.

The adoption of the Kunstadter system for naval vessels seems very probable, as the advantages in manœvering must be of great importance. This opinion seems to be emphasized by the fact that in the recent evolutions of the squadron of the British Navy one of the vessels lost her rudder, which, in order to secure quick turning, was of the usual large dimensions.

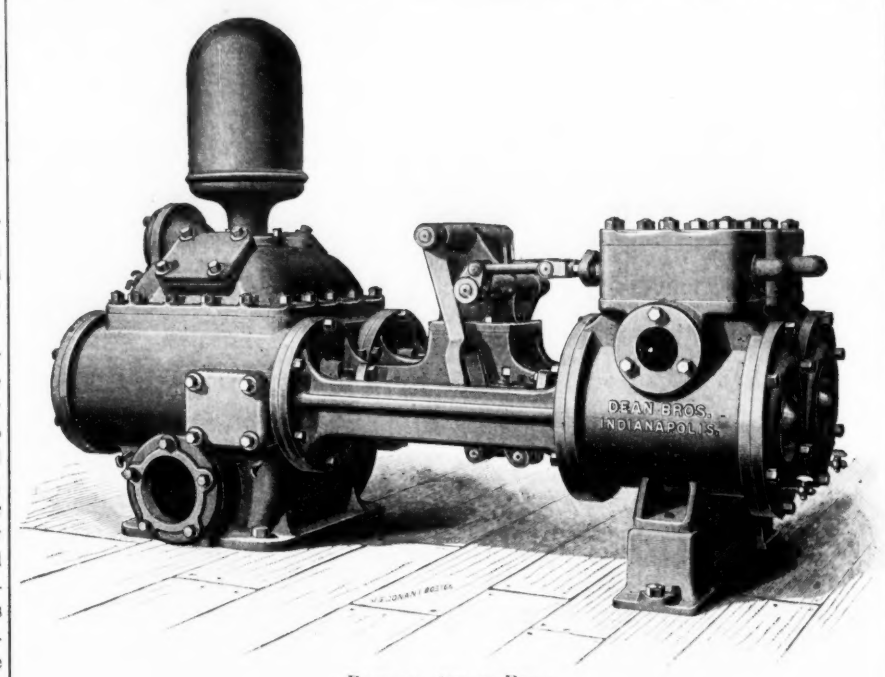
In the Kunstadter system the rudder is small, the turning being accomplished by a small screw behind the rudder. The shaft of this screw is journaled in the rudder, and connected with the main screw shaft, which projects through the main screw, by a universal joint. The small screw swings with the rudder, and operates directly to turn the vessel. It is said that this small screw, in going directly ahead, slightly improves the speed of the vessel. The system is applicable to any class of screw vessels.

The report of the board, recently made public, is full and complete, and is unqualifiedly in favor of the Kunstadter system, both for its effectiveness and mechanical simplicity.

An advertising machine is a late wrinkle in England. It consists of a tricycle, with revolving bulletin boards behind the rider, on which to display advertising cards. It is a decided improvement on the "sandwich" men who infest the streets of most cities, and its adoption might also enable some bicycle riders to do a little good in the world.

Improvement in Boiler Construction.

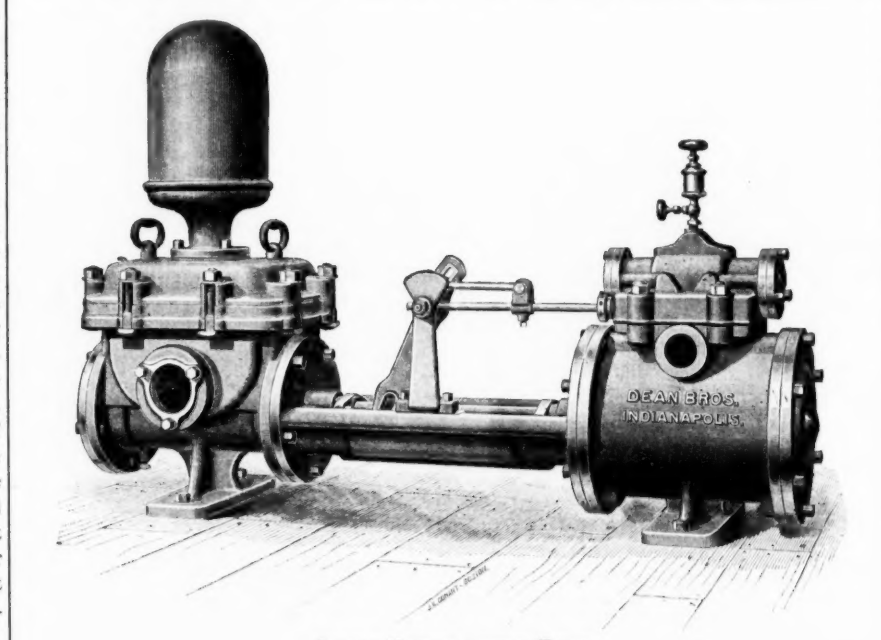
The committee of Master Mechanics, consisting of Jacob Johann, J. Davis Barnett and Allen Cook, made their report at the recent convention in sections, which we take up in part this week.



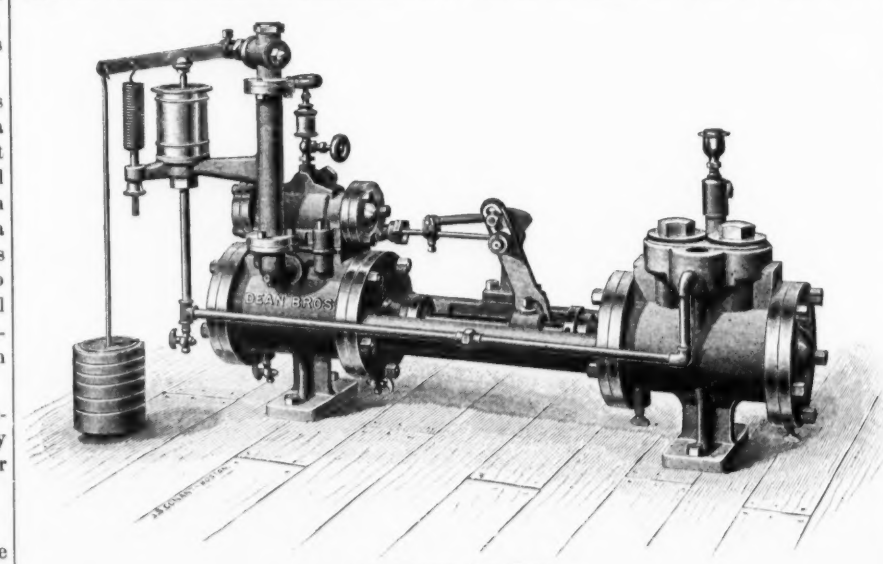
Duplex Steam Pump.

STEEL PLATE.

Steel was reluctantly used in 1869 (see page 10 of report for that year), but 200 boilers of steel are reported in 1875 (page 15), and it is recommended in that year (page 16), exclusively recommended in 1877 (page 52), and the committee is unanimous in 1878 (page 86). In 1870 an opinion from a French engineer was quoted (page 18), saying steel plates for boiler use should be capable of hardening; presumably he was using the metal in barrel plates and, to reduce their thickness and weight, required a metal of high tension which he would secure in a steel that tempered by immersion; but in 1871 (page 10) the complaint was that it was manufactured too hard, and in 1875 (page 16) steel that will not harden is recommended more especially for fire-box service. The steel we now easily procure and should use for both sheet and furnace, has but a small percentage of carbon, say from 15 to 20 per cent., and therefore, is fairly free from silicon, phosphorus, etc., will not harden, is mild and ductile, working under the hammer, even when cold, most freely; has a breaking resistance of from 62,000 to 65,000 lbs. per square inch of section, with an extension of 24 to 25 per cent. in length of 10 inches. A good shop test—in addition to bending over at a point in test piece where it has been punched either cold or after it has been heated and dipped in water—is to take a narrow strip through which a hole one-fifth its width is punched and then enlarge the hole with a drift and flogging hammer to fully three times its original punched diameter without splitting the strip.



Single Direct-acting Pump.



Automatic Air Pump.

It may be said that there is now no practical limit to the size that steel sheets of desirable quality and thickness can be procured. The Canadian Pacific Railway are making the straight portion of wagon top boilers in one plate, and receive sheets 14 ft. 3 in. × 8 ft. $\frac{7}{16}$ in., and last year at Erie, Pa., $\frac{3}{8}$-inch plates 16 feet long were bent cold in rolls to a curve of 30-inch radius, so that two sheets made one boiler 16 feet long and 60 in. diameter, with but two longitudinal joints in barrel; and Mr. Webb has rolled from ingot and used $\frac{7}{8}$-inch steel plate 11 ft. 3 in. wide × 12 ft. 9 in. long in one barrel ring. This practice is in line with the strong recommendation of the committee in 1871 (page 14), but as they point out it requires special rolls to be built for bending the plate. Mr. G. S. Strong says he is now constructing a 56-inch straight boiler for 175 pounds pressure, with all longitudinal seams welded. Welded seams, when iron plate and coke fire were used, give at least but an ultimate tension of 14 tons and 6½ per cent. extension for 22 ton iron; therefore, it is not a matter of surprise that such a form of joint was seldom used, but now Mr. S. Fox, using 22-ton mild steel and common gas flame for heating the scarf, secures a weld having an ultimate tension of 21 tons and an elongation of 8½ per cent. in a 10-inch length, that is an increase of 50 per cent. in strength and 30 per cent. in ductility; although it should be noted that this excellent result is but one-third the ductility of the unwelded steel plate. Some careful experiments show that very mild steel, after annealing, loses somewhat in resistance to ultimate tension and in ultimate percentage of extension, or, in other words, annealing does not necessarily improve the natural plate. Nevertheless if holes are punched in plate, or plate has been flanged or set when warm, mild steel must be annealed, the annealing furnace temperature not being carried too high—a blood or cherry red is quite sufficient—the time in furnace not prolonged beyond the point that will secure thorough and equal temperature, and the cooling not too much hurried by contact with damp earth, or a current of wind at low temperature. Neither should there be any attempt to "soften off" by cooling in a bed of sawdust or ashes.

If the flanging, setting or any other distortion, such as bending in the rolls, can be done cold, there is no necessity for annealing either plates or bars, but all such setting is preferably done under the steady pressure of hydraulic tools.

DISCUSSION.

Mr. Johann—"As chairman of the Boiler Committee, I wish to make a few remarks in opening the subject. The report of the committee for this year presents simply a review of all the matter that has been published heretofore. The subject of boiler construction and improvements has been gone over so much the committee was at a loss to know just what to take up for this year, and therefore they came to the conclusion simply to make a review, which has been read to you, and will, I presume, be presented to you now in detail, section by section, and, speaking for the committee, I wish to say that that is simply their idea of the various subjects that have been presented, and it is now for the members to take hold of it, discuss it and go for it in any way they see fit."

Mr. Setchel—"The first subject contained in the report is the use of steel. Is it the best material to use for boilers and fire-boxes?"

Mr. Sprague—"I am ready to endorse the use of steel for boilers and fire-boxes, but I am not prepared to endorse steel rivets. I have not had very great experience with steel rivets, but from what I have had, I must say they do not give me as much satisfaction as iron rivets."

Mr. Setchel—"If members will please confine themselves to the subject as announced it will help the secretary very much in compiling his report. The subject of steel rivets will come further on. Now, the members who read the St. Louis *Register* will recognize the fact that a warfare is waged by that paper against steel. There are many master mechanics who believe that iron will give as good results. I think it should be ascertained by this Association whether steel is being used as successfully as heretofore, or not."

Mr. Swanston—"I have not discarded steel. We are using steel and nothing else. I asked the question yesterday as to whether

some of the members had not discarded steel and gone back to iron."

Mr. Smith—"I abandoned the use of steel about five years ago, and since then have been using iron exclusively. I have never had any trouble with iron, while I have had a great deal of trouble with steel. I have never seen a failure of any kind with iron fire-boxes, while I am quite sure I never used a steel fire-box two years without discovering a serious defect."

The Chairman—"What fuel do you burn?"

Mr. Smith—"Soft coal. I would also say that we use the water of the Mississippi river, which holds a large amount of carbonate of lime in solution. That has a very deleterious effect on the steel. I would also say that we imported one fire-box from England. We had two which were furnished by the Baldwin Locomotive Works. The iron was of Coatesville. Several others were made of Tennessee iron."

Mr. Blackwell—"Will Mr. Smith tell what brands of iron he has been trying and found so successful?"

Mr. Swanston—"I would like to know also how extensively this has been tried?"

Mr. Smith—"I think there are about six of them now—engines which have been under severe service, running night and day. It is seldom that we have over eight or ten hours to wash out the boiler. In regard to the brand of iron, I cannot give the name of the manufacturer of the Baldwin iron. I only know that it came from Coatesville, Pa. The English iron was Lowmoor."

Mr. Blackwell—"What was the greatest mileage obtained with an iron fire-box?"

Mr. Smith—"This was under the St. Louis Bridge Company, and we kept no mileage."

Mr. Blackwell—"What kind of service would that probably be equivalent to?"

Mr. Smith—"I presume you would call it switching. It was transferring trains across the Mississippi river to St. Louis. The run was about four miles."

Mr. Swanston—"These were Baldwin engines, and all had steel fire-boxes when they went there?"

Mr. Smith—"Yes, sir."

Mr. Swanston—"How long did they last?"

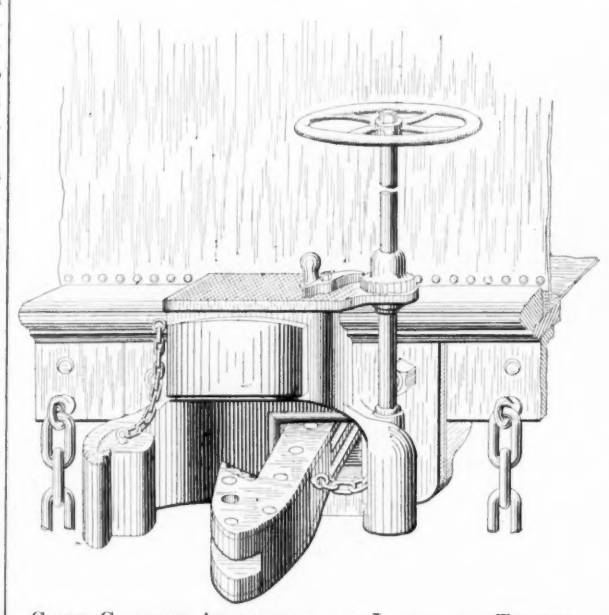
Mr. Smith—"There was none of them but what developed defects inside of three years."

Mr. Blackwell—"What make of steel did you find so very unsatisfactory?"

Mr. Smith—"I do not care about naming the steel. I would say, though, that I was informed by the Baldwin people that the Norfolk & Western Road also had trouble with steel."

Mr. Blackwell—"We had a great deal of trouble with iron as well as steel fire-boxes. I say this as a former representative of the Norfolk & Western. I tried the Lowmoor and the Hewston brand of iron, in the hope that it would prove more satisfactory than the steel; but I am sorry to say that the results of trials with iron were entirely unsatisfactory. A few engines built by the Baldwin Company for the Norfolk & Western Road were supplied with Lowmoor fire-boxes, and an equal number with Hewston iron, and nine engines with Otis steel fire-boxes. So far—and it is a matter of about two years' service now—we have had no trouble with the Otis steel. Four iron fire-boxes have given out—two of Lowmoor and two of Hewston—and they will have to be renewed within a month or two. No trouble has been experienced with Otis steel, providing that samples from the plates were examined and found to come within our specification."

Mr. Setchel—"Twelve or thirteen years ago, the Ohio & Mississippi people, that I have had the honor of representing for the past three years, bought forty engines from the Baldwin Works and ten from the Grant Works, and up to two years ago none of those fire-boxes had been renewed, and they were all made of steel, and the service those engines had performed had been, I suppose, as hard as any road in the country; they averaged a monthly mileage of from 4,500 to 5,000 miles. It seems to me that a material, to give such results, must be very good for fire-boxes. In regard to the service of the engines, of which Mr. Smith speaks, he must pardon me if I state that such service is nothing compared with the service of engines on the road. We can take an engine that will hardly hold water running a train out on the road, and put it at the service of which Mr. Smith speaks, using the Mississippi water, and run without any trouble whatever. While connected with the Miami Road, where I was located about twenty years, we found that we could take engines that would fail entirely, using hard water upon our Springfield division, and bring them to Cincinnati, and use the Ohio river water, and they would not only tighten up, but the water would take off the old scales, and we could use the fire-boxes, whether made of iron or steel, any length of time. You could patch the fire-boxes, and run them without any trouble at all. I am unable to say why any kind of material, using the Mississippi water, should give out, unless on account of being mud-burned or something of that kind. I think it has been the experience of our members that they could use any of our river waters, it made very little difference what kind of material the fire-boxes were made of. That has been the expression of members for the past fifteen years that I have been connected with this Association. With such an experience as has been presented by the reports of this Association, it seems that if there was any great failure of steel in the country there would be a representation here to-day that would be able to state it, and I think if we have any members here who have that information, and go away without stating it, they make a mistake and do injustice to the Association. The country looks to us for this information. They are constantly writing to this Association from New Zealand, from India, and from all over the world, to know what we are doing in regard to steel fire-boxes, what we are doing for smoke-stacks, for the prevention of floating sparks, etc. They say, 'Send us out your reports; we want them.' We should not send out any false impressions. We should give correct information—something that we will be able to stand by."

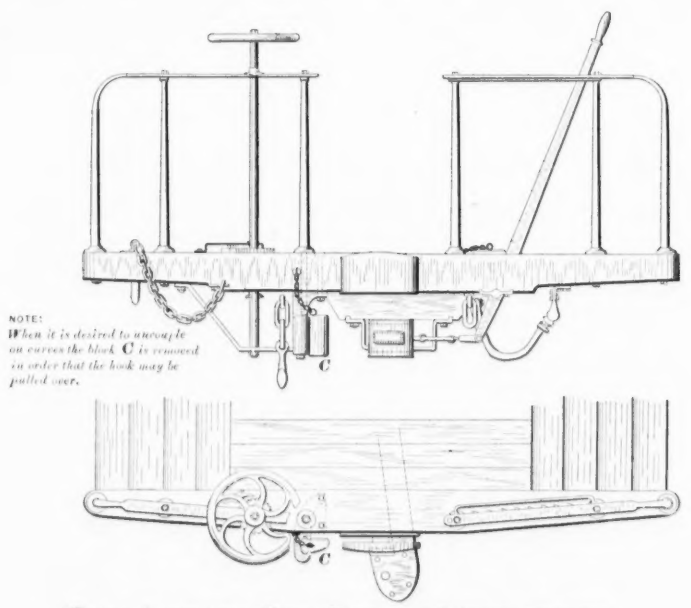


Colby Coupling Attachment for Locomotive Tenders.

Mr. Blackwell—"I quite agree with Mr. Setchel in regard to the service of the engine, whether the results are disastrous or otherwise. I may say that one of the engines with the worst cracked fire-box that I referred to just now, is now engaged at switching service, and doing satisfactorily, and may continue to do so, if they choose, for years, without trouble. It is when an engine is hard at work, pressing the fire-box for the utmost result, and consequently getting an excessively high heat, that the ill effects are produced. As long as an engine with a cracked fire-box is doing such light work as switching service, of course the ill effect already there is not increased. As regards iron fire-boxes, I may say that another brand of iron was used on the Norfolk & Western Road when I went there. I found that we had to abandon it, as it acted exactly like steel. Men accustomed to examine cracked steel fire-boxes, were prepared to state that they were made of steel. Instead of that, they were iron. They gave us very unsatisfactory results. By running from four to eighteen months, they had to be renewed."

Mr. Shaver—"When we first commenced to use steel, we had some little trouble with fire-boxes cracking, but for the last twelve years I have not known any cracked sheets. I have not known of one giving out unless there was some good reason for it. For myself, I do not want any iron box."

Mr. Turreff—"I don't think I shall go back to iron again. I have had such good results with steel for fire-boxes and boilers, I am prepared to endorse it as a good material. While we have had exceptional cases of failure, yet the majority overcomes them. Take a fire-box that has made over 4,000 miles a month—which is exceptional mileage—and it speaks well for the steel. While probably that is an extreme case, yet, as a whole, in the coal that we burn, which is very severe, and particularly in the service that we run our locomotives—high-speed passenger service—we have had very exceptional results, I think. We have several engines that have made over 100,000 miles, and the fire-boxes to all appearances can run, perhaps, 75,000 miles more. We have some locomotives that have been in use since 1869 with steel fire-boxes, and the crown sheets are still in them. The side sheets that we have used usually have been a quarter of an inch thick, and we have had very good results. It has been a question, sometimes, in my mind, as to the quality of the steel—whether it should be crucible steel or something else. We are using both kinds, and I can say we have no desire as yet to go back to iron. We have a number of boilers running with iron, which have proved very satisfactory. But one thing in the use of steel that overcomes the use of iron is, we do not find any blisters—the material is perfectly homogeneous. The most trouble we have is occasional cracks. We do not consider steel a failure by any means, and we propose to continue its use."



Colby Adjustable Guide Block for Miller Coupling.

Mr. Meehan—"We have 160 engines equipped with steel fire-boxes. The greater portion of them, I believe, are of Otis steel. We have also ten equipped with iron, and out of the ten there were eight that were blistered, and we had to take the boxes out before they were worn."

The Chairman—"When Mr. John Hurley was on this continent, the Pennsylvania people gave him some figures. Taking ninety-one of their engines, they found that the average mileage per engine before the fire-box failed was 219,926 miles. One steel box made a mileage as high as 505,890 miles, and the smallest mileage made by any one engine was as low as 55,860. I think a general average of 219,926 miles is a large mileage."

Mr. Stevens—"I would like to inquire what the term 'failure of fire-boxes' means. Was the box entirely worn out, or was it the failure of any part of the box?"

The Chairman—"Renewal of the fire-box throughout."

Mr. Stevens—"That was when the fire-box was completely worn out."

Mr. Setchel—"I think it is generally understood that when a fire-box cracks or fails in any one place, that that practically is a failure of the fire-box, because in burning coal with us it is very hard after a fire-box fractures to keep that box in good running order economically. I think you had better take it out, as a rule. When I spoke of the life of the Baldwin engines on the Ohio & Mississippi Road, that was what I meant, that the fire-boxes were practically perfect after twelve years' service."

Mr. Stevens—"That is just the point I want to get out. The fact of having the fire-box all wear out is altogether different from the Lake Shore Road's experience. The tube sheets there will run twice as many miles as the side sheets will, and it is not seldom that a crown sheet will wear out two tube sheets and four side sheets. I think that it is important in getting at this—that we should not be misleading."

Mr. Shaver—"If crown sheets will give out much faster, how do you account for that?"

Mr. Stevens—"The crown sheet will last the longest. There is no trouble with the crown sheets if they are kept clean. The reason why the side sheets wear out quicker is because they get hotter."

DRILLING *vs.* PUNCHING.

In 1872 (page 19) preference is given to drilling rivet holes rather than to punching, but with the leather-like ductile metal now supplied, and within the limits of ordinary thickness of boiler plate used in locomotives, the extra expense of drilling is not justified, and the excess of diameter of hole in die over punch need not exceed $\frac{1}{32}$ inch for plates $\frac{1}{2}$ inch thick and under.

DISCUSSION.

Mr. Setchel—"The next subject involved in the report is: 'Drilling *vs.* Punching: Which is the Best?' And most practicable. I suppose that would be the idea. I know in the history of this Association there were a number of years when we first commenced using steel, that our best members strongly advocated the drilling of sheets, but I find, almost without any noise being made about it, the majority of the members have quietly dropped back and are punching their sheets. While I believe that in England there have been some experiments made, where it would tend to prove that it was much better to punch than to drill the sheets—I cannot give the particulars of that,

but I have read in some of our journals of tests being made to that effect—I think if we made an error in advocating drilling of sheets exclusively, that we should let it be known and go back. But if we still believe in drilling certain portions, why, that also should be known—at least, let it be understood which is thought by the members of this Association to be the best way."

The Chairman—"I think the English experiments Mr. Setchel refers to, proving that it was stronger to punch than to shear, were some experiments designed to test riveted joints where it was endeavored to so design the joint that it would fail by shearing the rivet. In that case, under these conditions, quite a number of the joints showed very much greater resistance to shearing the rivet with a punched hole than with a drilled hole, the reason believed to be that the sharp edge, or square edge, left by the drilling was more effective as a shearing edge than the somewhat jagged edge left by the punch."

Mr. Woodcock—"I think the question in the matter that has been referred to by our secretary largely depends upon the quality of the steel. I do not think it is necessary to drill holes in the open hearth steel, but where we use crucible steel I think it would be necessary to drill them. This is our former experience. There are very few, I presume, using crucible steel at the present time, but if we should resort to that I should be inclined to drill the holes. That has been our experience in former years when we were using crucible steel. But the makers of the present open hearth soft steel contend that it is not necessary to drill the holes. For that reason I think we have fallen into the habit of punching the sheets, first, because it saves time and expense, and of course that is quite an item."

Mr. Sinclair—"In regard to this matter, I would draw the attention of our members to certain experiments that were made last year at the works of Hoopes & Townsend, in Philadelphia. They drilled certain sheets and punched others, of precisely the same quality and the same size, and they found that there was a considerably greater tensile strain required to fracture the punched plate than there was to fracture the drilled plate. Now, in that case, the reason which our president gives for the punched plate probably standing the greater blow would not hold, because the sheets were taken singly. It was not a shearing strain that was tried. It was merely the tensile strain of the sheet after the holes had been drilled. These experiments seem to me very conclusive in that matter. It was all, however, soft steel that was used, and some iron plates, if I am not greatly mistaken. I think these experiments will be of great interest to all of you if you were to look up the accounts of them."

Mr. Lauder—"I suppose 99 per cent. of the members of this Association will continue to punch their plates, no matter what we may say here."

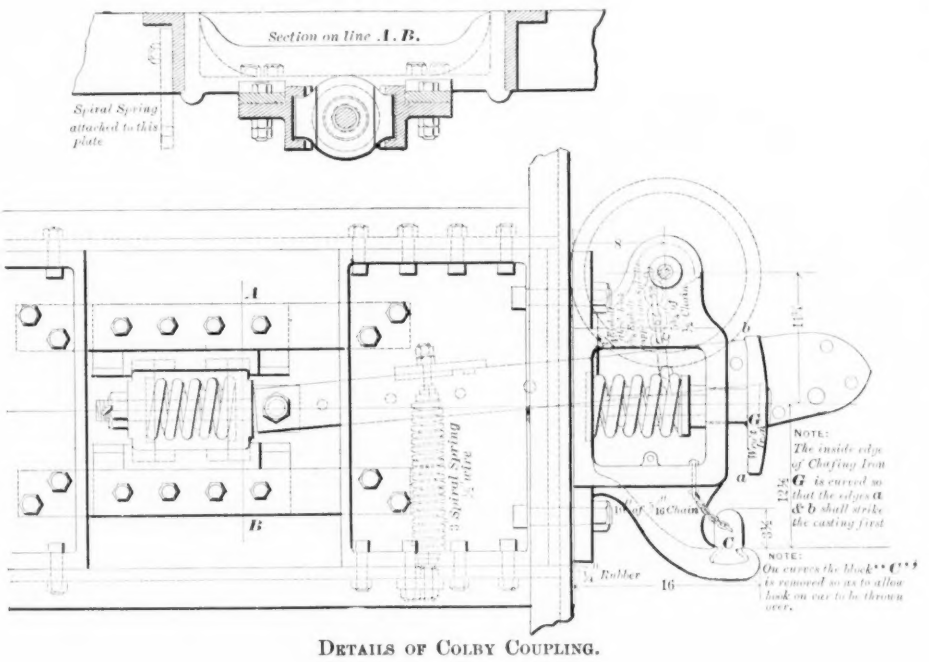
Improved Form of Colby Coupling Attachment.

In our issue of April 12, 1884, we illustrated the Colby coupler. With the present form of the Miller coupling, cars cannot be uncoupled on curves, which fact often causes trouble and delays in separating and making up trains.

To obviate this serious difficulty, the improved form of the Colby Coupling Attachment, shown in the annexed cuts, has been made and applied to the locomotive tenders of the Boston and Albany, and other railroads, with perfect success.

The improvement consists of an adjustable block *C*, so placed in the extended arm of the back casting that when the train stands on a curve the block can be pulled out, allowing the hooks to be separated, and the cars drawn apart.

In adapting the improvement to passenger cars, a small casting holding the adjustable block, takes the place of the old guard or "boot" (as it is generally termed) as shown in the cut. The adjustable block *C* is loosely dovetailed into the casting, and is allowed to so bottom that it can never pinch nor stick so as to cause trouble in getting it out. The detail drawings show it as arranged on the Boston & Albany railroad, of which road, at Boston, the inventor, George H. Colby, is master mechanic.


Section on line A. B.
Spiral Spring attached to this plate
Bridle Irons
Chain
Rubber
16
NOTE:
The inside edge of Chafing Iron G is curved so that the edges a & b shall strike the casting first
NOTE:
On curves the block "C" is removed so as to allow hook on car to be thrown over.

Details of Colby Coupling.

It is stated that a number of cotton mills are profitably introducing machinery for making up their waste material into cordage, etc.

LETTERS FROM PRACTICAL MEN.

Old and New Iron—Some Experience in Uniting Cast and Wrought Iron.

Editor American Machinist:

In a recent issue of the American Machinist, "Tapping Bar" takes the ground that new iron possesses the valuable property of lying closer to, and adhering more firmly to, wrought iron when cast upon it, than old metal. My experience has proved to my satisfaction that there is no perceptible difference.

My patience and resources were severely tried on one job of this kind. It was desirable to cast ends on rods $1\frac{1}{4}$" to $1\frac{3}{4}$" diameter, the ends to be quite thick and bulky, and about 6" long. These rods were of both iron and low-grade steel.

There was heaps of fun with these little things. What would seem to be a complete cure on Monday would turn out to be a perfect failure on Tuesday. They were cast at the first of the heat, in the middle and at the last with equally varied results. They were covered with red lead, threaded coarse and fine, and buffed bright as silver, put in cold, and put in heated to all the colors of the rainbow, and finally were tinned.

The last named method was the most successful, but even then there was no certainty about the job; there still remained an uncertainty as to the welding of the ends. The end of the rod was covered by the iron casting, and it is my opinion, that the gases being generated and expanded by the hot cast iron issued at the ends and caused the imperfections.

Many of them would appear sound until the outside was removed, when holes $\frac{1}{2}$" diameter would appear.

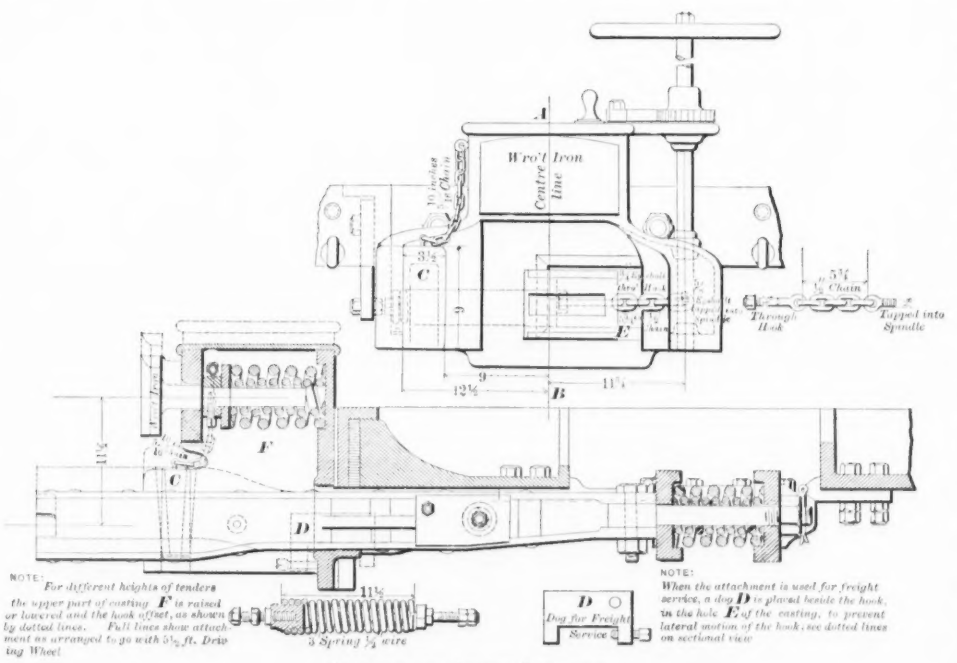
A number of years since, I was employed by a car manufacturing company. We had a large number of small rollers or wheels to make, 5" diameter and 1" thick, with wrought-iron spindles cast in them. They were given to a moulder, who wrestled with them, day after day, the proportion of good ones being about 25 per cent. He became discouraged and "went West." The job was then given to a deaf and dumb moulder. He arranged the patterns in the flask, so that he ran a gate up to and against the end of the wrought-iron spindle in addition to the gate to the casting. He put on a gate the full size of the spindle, and an ordinary gate on the casting.

The result was that the first day he saved all—80 in number; second day the same. I soon ceased to worry about that job.

These castings were not finished; had it been required that they be perfectly sound, no doubt many would have been rejected.

Considerable experience has convinced me that the "why" cast and wrought iron will not unite, is what no fellow has yet found out.

Moulder.


Wro't Iron
Centre Line
Through Hook
Tapped into Spindle
NOTE:
For different heights of tenders the upper part of casting F is raised or lowered and the hook offset, as shown by dotted lines. Full lines show attachment as arranged to go with 5½ ft. Driving Wheel
3 Spring ¾ wire
Dog for Freight Service
NOTE:
When the attachment is used for freight service, a dog D is placed beside the hook, in the hole E of the casting, to prevent lateral motion of the hook; see dotted lines on sectional view

Details of Colby Coupling.

Train Resistance and Engine Friction—Extension Smoke Boxes.

Editor American Machinist:

In Mr. J. G. A. Meyer's paper on "Modern Locomotive Construction," in your issue of July 4, he gives the frictional resistances of wagons as $7\frac{1}{2}$ lbs. per ton, due to rolling friction and axle friction—a figure with which I practically agree. At the close of page 4, however, he makes the astonishing statement that this amount of $7\frac{1}{2}$ lbs. per ton may also be calculated as the force necessary to move the engine and overcome the friction of the machinery.

From a previous paragraph in his paper, it is clear that Mr. Meyer is aware of the existence of a dynamometer, but he must be totally unacquainted with the lessons it teaches to have made the above statement.

In some most accurately-carried-out experiments made by Mons. Regray, the locomotive engineer of the Eastern Railway of France, he found that the friction of the mechanism alone, apart from the power necessary to move the engine and tender, as vehicles, was 34.2 per cent. to 35.6 per cent. of the total power developed in the cylinders, and that the net power available on the draw-bar of the tender for pulling the train was only about 45 per cent. of the total power developed in the cylinders.

I, of course, observe that Mr. Meyer excludes speed in his calculations, but this does not practically alter the question.

Some years ago Messrs. Veuillemin, Gebhard and Dieudonne published the most extensive series of experiments on engine and train resistances that have come under my notice.

In your issue of July 11th, I see the question asked in Mr. Frank C. Smith's paper: "Of what use is the extension, as used in three out of five roads? Practically as a spark arrester, none at all."

You are of course aware that such extensions of the locomotive smoke box have never been tried in this country, so I have never had an opportunity of seeing them in action, but it seems to me that any benefit obtained from their use must be due to their action as air vessels equalizing the action of the exhaust produced by the blast in the same manner as suction vessels on pumps make the flow of water in the suction pipes more uniform, thus enabling the size of the blast nozzles to be reduced. Should this smoke box extension in America act as I have supposed, I assume of course that smoke boxes there as well as here are made perfectly air-tight.

Druitt Halpin.

9 Victoria Chambers, London, England.

Sunday Work—Division of Power.

Editor American Machinist:

Mr. Hobart, in No. 29, inquires how we are going to stop Sunday work. In one large mill the method adopted for preventing the mill stopping in working hours, was to have competent men to make in some places daily, and in others weekly, inspections of belts, gearing, couplings, keys, etc., in the noon hour, and if anything wanted doing, do it then. In this way the condition of all the machinery and belts was known at all times, and if a main belt was getting weak, it was known long enough ahead, so that, everything being got ready, it could be laced in the noon hour. In this way the machinery was kept in first class condition, with no night and no Sunday work. The shafting was lined up and general repairs done holidays, or when shut down for inventory.

About the work on the engine. A first-class American engine, if properly taken care of, don't require to be continually "tinkered" with. One great point with a good engineer is to know when to let things alone, and the man that has that faculty is worth more than the one that makes a great ado about being able to do "his own re-

pairs." See back numbers of AMERICAN MACHINIST.

When it comes to the boilers, the question is different, as they have to be cleaned, and to be durable should be cleaned cold. With them, the only way out is to have extra boilers. Say we have a plant requiring fifty boilers. Put in sixty, and you have ten to lay off for cleaning, and you get around to each to give it a thorough going through with; plenty of time once in six weeks, and always have boilers warm to fire under Monday mornings, if Saturday afternoon the cleaned boilers are filled up with water from the heater, and this item alone goes a long way toward paying the cost of the extra boilers.

I see Mr. Hobart brings in his idea of the division of motive power. An ordinary electric light plant must make him dance with delight, until the time comes for declaring dividends, when the result figures up something like this: We have a number of small engines that require 40 lbs. of water per horse-power. We have consumed 4,000 tons of coal at $4 per ton, cost, $16,000. If we had one large condensing engine at 20 lbs. water per horse-power, it would have been 2,000 tons, cost, $8,000.

To prevent Sunday and night work, have your shafting well designed and put up, and examine everything regularly and often. Put in Mr. Hobart's much despised friction clutch on the shaft of each department, or each room if you wish.

If a person gets caught in the machinery, the shaft can be stopped quicker than the engine can.

Put in plenty of boilers, and don't "tinker with the engine too much."

W. E. CRANE.

Making Devices Known.

Editor American Machinist:

Mr. Goodyear asks if it is not strange that so many old things are now-a-days brought forward as new. But may we not find a partial solution to this in the fact, that in those days they did *not* "write work" as we do now, and that there was then no AMERICAN MACHINIST to write in?

J. C. GREEN.

Bartleyville, N. J.

Brown's Method of Laying Out an Elbow.

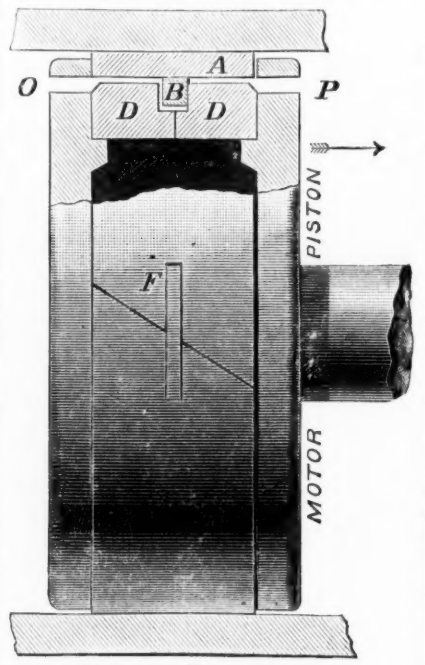
Editor American Machinist:

I had an opportunity, a few days ago, of observing the ingenious methods displayed by my old friend Brown in the laying out of difficult pieces of boiler-work, and, as I notice in your columns a letter from a boiler-maker giving an account of a mutual improvement association, I will endeavor to explain in my way the old man's "kink" in laying out a goose-neck and square elbow, thinking it may be of interest to the parties forming the association, as well as to your boiler-maker readers in general.

On the occasion of my last visit to Brown, I could detect an air of disturbance in the old man's manner, and on that account loitered around in a careless way watching his movements carefully, and mentally noting his proceedings, fully convinced that I would learn something of interest before ending my visit.

There were four or five sheets of light iron on two trestles when I entered the shop, and the old man's interest seemed entirely centered on these plates. Spectacles were adjusted, a chalk line brought into play, and a line struck from one end of the sheet to the other. Attention was then given to a small drawing, then a square and straight-edge were used and a line drawn at one end of plate at right angles with the chalk line mentioned; reference was then had to a small book, and after much study measurements were made from the last line drawn, resulting in the making of another line apparently equidistant from the last, after which measurements were taken from the first line, resulting in the formation of a parallelogram covering about one-half the surface of the sheet.

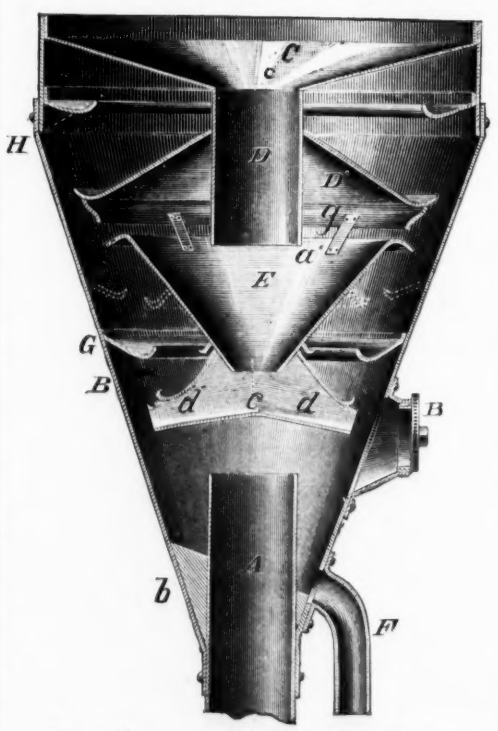
The old man then divided the distance between the lines with considerable care, after which he dipped a small brass tube in white lead, and made a mark at each space so divided. The sheet was then taken away, cut in two, and the piece described had holes punched where marked with the lead. While this was being done, Brown became quite communicative, and informed me that he had a crooked smoke-pipe to make, and it seemed to him as if the parties ordering it wanted to see how crooked a thing they could get to carry the smoke away from the boiler. "Why," said he, "there is an elbow in it and a crooked bend, and, as it has to go over a hundred miles from here, I must be



BRANDON'S PISTON PACKING.

careful to have it exactly right, otherwise there will be —— trouble." As the old man is profanely inclined, I will not quote his exact words, but your readers can fill the blank to suit their ideas.

The piece by this time having been punched, "Joe" was instructed to have four more made from it. The piece sheared off was then returned to the bench for further



STEAM-CONDENSING EXHAUST PIPE HEAD.

manipulation by Brown, who proceeded, as already described, readjusting the dividers, as the distance seemed changed.

This, Brown informed me, was for the purpose of having one sheet, when rolled, fit inside of the other, making, as he expressed it, a large and small course.

"Joe" was called and instructed to make three pieces from the last piece, and one blank on the long sides.

Another workman was now instructed to *roll up* the sheets as fast as they were punched, and in a short time a piece of pipe, about fourteen inches in diameter and three feet long, was taken from the rolls. This was soon followed by another, and continued until all were completed. "Joe" being the leading man, now commenced to put the pieces together and rivet them up, Brown taking the blank piece, already referred to, and measuring it carefully in different ways until he seemed satisfied with his work. He then called a couple of helpers, and with them proceeded, carrying the blank, to a barrel of water, and Brown, with their assistance, lowered the blank at an angle into the water, slowly and carefully, until it had been immersed up to his mark; it was then swiftly withdrawn, and while wet was marked with a slate pencil at the point indicated by the water mark. This was now cut off, and a similar course taken with the other part, after which Brown had both pieces taken to the fire, where he turned a small flange on each, and the two pieces were placed together, forming a very accurate right-angled elbow.

I don't know whether the old man knew of any other method than this for getting out such pieces, but to me it showed great ingenuity on his part. One of the other courses was also measured and marked by the old man, and also immersed in the water, and by careful manipulation a bend not quite equal to a square was produced from three pieces bevel on each end.

I was much interested in all of these proceedings, and on the following day again visited the shop to see the work complete. Brown by this time had a wooden template made of the exact length and proper angles for the completed job, and I can assure your readers the old man's features beamed with pleasure when he saw me take such an interest in his work, which he assured me was "as near perfect as any one could make it." I could see nothing in it to criticise and left. Should I see anything new in the future I will inform you, as I think boiler-makers are regular and attentive readers of your paper.

ANCIENT.

Brandon's Piston Packing.

The piston packing illustrated herewith is the outcome of the efforts of a practical and experienced mechanic to overcome difficulties that had come under his observation in machinery in his charge. Investigations and experiments on piston packing rings had satisfied him that when a piston moves forward, the inertia of the ring, and also the friction between the ring and cylinder, tend to make the ring bear tight against the rear flange of the piston, leaving a slight opening between the packing ring and the front flange of the piston. From this it will be understood that in pistons having packing rings cut for expansion, made in the usual way, when acting as pumping or compressing pistons, the working fluid will get on the inside of the rings, forcing them radially against the cylinder with a force equal to that of the pressure of the working fluid acting on the whole inside surface of the ring.

He also found, by experiment, that a certain amount of the fluid under pressure creeps in between the rings and cylinder, tending to force the rings off their seat, this force being equal to about one-half of that of the fluid under pressure acting on the whole inside surface of the ring.

The theory of this action, and some experiments on the same, were explained in the AMERICAN MACHINIST, June 2, 1883, in an article on slide valves, by Professor S. W. Robinson.

As a result of his investigations and experiments, Mr. Brandon finally constructed the piston packing shown, the theory and operation of which may be understood from the following description:

The engraving represents a piston partly in section, in which *A* is the main packing ring cut for expansion, and a piece set in to break joint in the usual way, as shown at *F*. *D*, *D* may be regarded as part of the body of the piston, made in two parts, as shown, or in one part, or solid with the piston heads, as may seem advisable. *B* is a small ring fitted in the groove in the central part of the body of the piston, *D*, *D*.

The ring *B* is cut for expansion, and a piece set in to break joint in the usual way. It is made to bear against the outer ring *A* the same as a packing ring bears against the cylinder. *O* and *P* represent two of several holes in the flanges, as shown.

Now, assume the piston to be moving forward as from left to right in the engraving, and that it is used for a steam engine. The outer ring *A* will take the position in which it is shown. The steam pressure being behind the piston, will pass in through the holes *O*, between the ring *A* and body *D*, forcing ring *B* against the forward side of groove in *D*, *D*. It may be seen that the pressure of the steam forcing the ring radially against the cylinder is limited to that of the inside surface of ring *B*, and that part of ring *A* lying between ring B and the rear flange of piston, leaving that part of ring *A* lying between ring *B* and the front flange of piston, relieved from internal pressure.

Assume the piston is used for a pump. Then as the pressure is in front of the piston it will pass through the holes *P*, or between the front flange and the ring *A*, forcing the small ring *B*, against the rear side of the groove in *D*, *D*. Now it may be seen that when it is used for a forcing piston the pressure on the inside of the ring, forcing the ring to the cylinder is limited to that of the inside surface of the ring *B*, and that part of the inside surface of the ring *A*, lying between *B* and the front flange of the piston, leaving that part of ring *A* lying between ring *B* and the rear flange of the piston relieved of internal pressure through the holes *O*.

The ring *A* is fitted in the usual way between the flanges of the piston, and *B* in the groove, the spaces on the side being left open so as to more easily understand the working from the engraving. The construction is not, of course, limited to that shown, which is intended to explain the principle involved. The aim is to provide a piston that shall be self-packing against pressure, but in which the pressure shall be so balanced as to permit neither the forcing the rings outwardly so hard as to rapidly wear out the rings and cylinder, or the forcing them inwardly so as to permit the fluid to pass by them. Mr. Brandon has submitted the results of a large number of experiments he made in determining the proper proportions to secure the desired ends, to Professor Robinson, who finds them to be in accordance with theory, and with experiments which he has made.

Packing made as described has been in use for, we believe, a year or more, with little or no wear of parts, and showing direct saving in power required to operate.

The address of the inventor is James Brandon, 233 Tenth Avenue, New York.

Improved Steam-Condensing Exhaust Pipe Head.

The protection of roofs, walls and other portions of buildings that are exposed to the condensed water from the exhaust pipes of steam engines, has received a good deal of attention, and is really, especially in cities, an important matter. A device for this purpose should protect the roof and walls from hot water, which destroys roofs and cuts out brick walls very rapidly, and should deaden the sharp, unpleasant sound of the escaping steam.

The device illustrated herewith, it is claimed, will satisfactorily accomplish these ends, as well as others of importance. The arrangement is very clearly shown in the engraving, from which its operation can be seen without detailed description.

An incidental advantage of the use of this head is that a large percentage of the water evaporated in the boiler can be returned to tanks to be used for any purpose, or fed again to the boiler, the grease, if any is present, being separated and held in a suitable receptacle provided for it.

No back pressure whatever is added by the use of this head; the escape to the air is dry and nearly noiseless, while passers-by, on the sidewalk, are protected from showers of water in the summer and ice and sleet in the winter.

The head is made in any shape to suit special conditions; they can be adapted for use with stationary engines, steam pumps, on steam-tugs, yachts, steamboats, steamships, etc.

More than 700 of them are, we are informed, in use in Chicago alone.

A. Aller, 109 Liberty street, New York, is general agent for these exhaust heads.

Secretary of the Treasury Manning has sent out a circular to manufacturers and importers, asking for information, views and suggestions relating to the tariff and methods of collection. He prefaces the letter by saying the information asked for is desired to enable the department to lay before Congress a plan to prevent under-valuations, and simplify the work of collection, by making the duties specific, instead of *ad valorem*.

New Clamp Coupling.

The engraving represents a new form of clamp coupling, brought out by P. Pryibil, 461 West Fortieth street, New York. It appears to be a simple and strong coupling.

The shafts to be coupled are held between two clamps, one of which is continuous throughout its length to secure alignment of the shafts. The other is divided at the center lengthwise, to enable it to clamp each shaft independently.

In applying this coupling, it is not necessary to remove the clamps, but simply to slack them.

The Whitlock Vertical Engine.

In our issue of July 28, 1883, we illustrated the Whitlock engine, as then put on the market in small sizes. As this is a lap-valve engine, the experience of the builders has been that with the flat, unbalanced slide, at the large travel desirable for securing expansive working, or the large surface if ports were lengthened to reduce travel, too much friction, strain and wear of ports resulted. This consideration has led to the use of a balanced piston valve, which, working without friction, permits any amount of travel desired without a consideration of loss from friction and wear of valve connections.

The construction and arrangement of the rings of this piston valve are its main feature. They are lap-joint split rings, turned larger than the bore of valve cylinder, cut out and sprung together, so that the ends of the lap-joints come together, showing, in appearance, a whole ring. In this condition they are turned to fit the valve cylinder, and, being held together between flanges by a nut on the end of rod, they will expand and fill the cylinder the instant the nut is loosened; then the nut being screwed down tightly, the piston is made practically a solid one.

The rings fit on a solid hub or sleeve that passes through the exhaust chamber, and counterboring leaves the edges sharp and square for a distinct and sharp cut-off.

The engine being vertical, the weight of the valve is inoperative to wear the valve cylinder out of round, and there being no constant pressure, as when spring packing is used, the wear of parts is very small. All that is required to compensate for slight wear is to loosen the binding nut referred to perhaps once in six months, and let the rings spring to place.

The valve cylinder is counterbored, so that the rings run over at each end, and the port is continuous all around the piston, so that the pressure is entirely equalized.

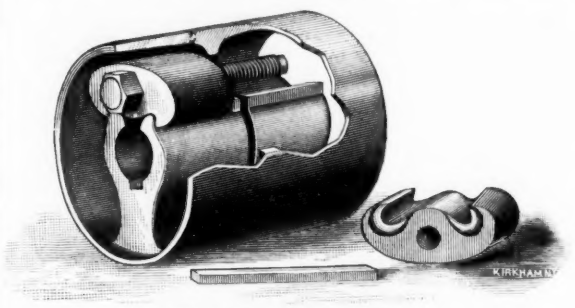
The rocker arm is dispensed with, slides being substituted, which reduces the number of joints to get out of order. Every joint, as this style of engine is made, is adjustable by means of screws.

Seymour & Whitlock, Newark, N. J., are the manufacturers.

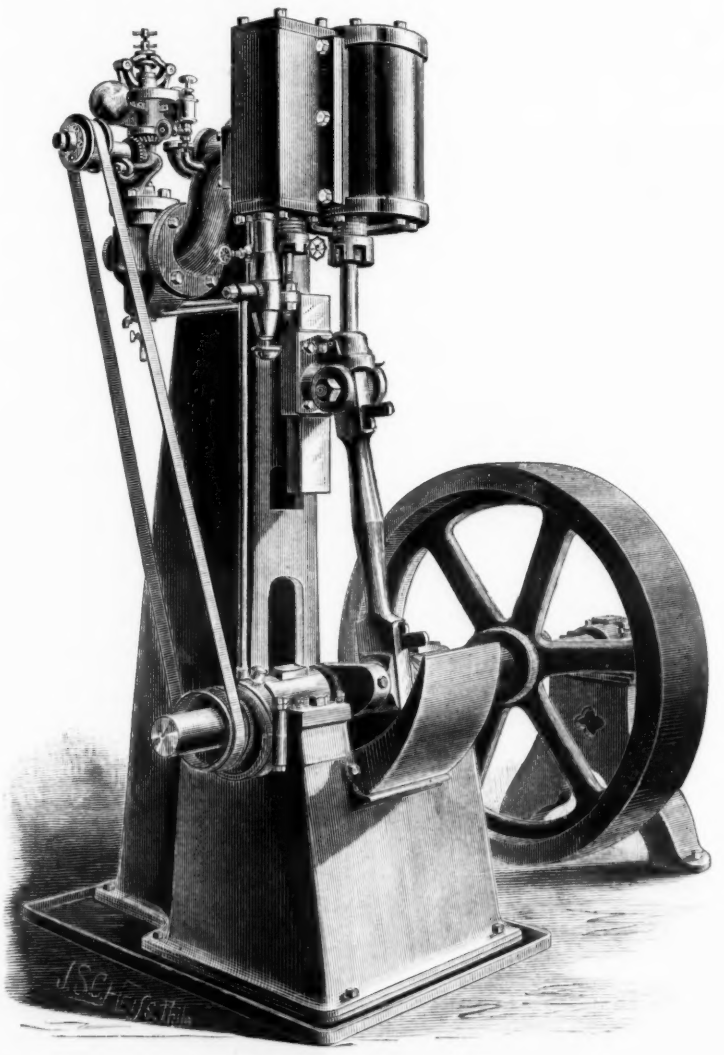
The St. Louis *Stove and Hardware Reporter* has the following:

A correspondent in Texas writes that box stoves are being hawked about the State by some of the interior manufacturers at 2½c. and 2¾c. per pound. The small country manufacturers have for some years had a monopoly on box stoves. A well-known and extensive manufacturer, who can't make these goods as cheaply as he can buy, says: "Yes, these little country foundries are family affairs, and they have the bulge on cheap work. The family live in the foundry and do all the work. When they have made up a car-load of something the goods are shipped West, and one of the boys goes along to sell them. Do they sell them? Indeed they do, and they make money if they don't receive half price. Then the old man and the boys, and the old woman and the girls, go back and make another car-load. The plant represents about $2,000, and there are no expenses outside of the family living." Possibly the manufacturer quoted intends to speak sarcastically.

They are moving in Massachusetts to abate what the people of that State, some of them at least, believe to be the nuisance of the locomotive whistle. The argument is that by frightening horses and working upon the sensibilities of nervous people the use of the whistle is the cause of more damage than is balanced by the good it does. The whistle is one of the time-honored adjuncts of the locomotive, and we hope while the balance between its good and evil qualities is being struck that impartial reasoning will be observed. So far we have noticed no argument showing the quieting effect that "reaching" for the whistle has upon the nerves of the engineer. Perhaps engineers are not supposed to have nerves. Besides a good deal of skill is evolved in getting out peculiar sounds—over-sensitive people call them unearthly shrieks—from the whistle. Abolishing the whistle would put a stop to a good deal of original research in the direction of vibratory action and acoustics. We do not believe the whistle has yet outlived its usefulness.



NEW CLAMP COUPLING.



THE WHITLOCK VERTICAL ENGINE.

American vs. English-Built Iron Ships.

In an interesting interview with a reporter of the N. Y. *Evening Post*, a member of the iron shipbuilding firm of Cramp & Sons, Philadelphia, says he does not think the iron shipbuilding business in this country is more depressed than other manufacturing interests. Being asked if his firm would accept a contract from the Government after the recent opinion of Attorney-General Garland in the Dolphin case, he replied that they would, without the least hesitation, but that they would not guarantee anybody's work except their own, meaning that they would not agree to build vessels on plans, specifications and models furnished by the Navy Department, and guarantee a certain result. They would guarantee results, but must be left free to build according to their own plans—of course under reasonable conditions as to size and class. Under any conditions of divided responsibility, they would not make any guarantee whatever, and would refuse a Government contract, or any other.

Mr. Cramp accounts for the present status of the shipbuilding trade in this country by saying that capitalists have thought it better to put their money into railroads, than into the construction of ships. He further says that his own firm (and presumably any of the six large shipbuilding concerns situated on the Delaware river) would guarantee to build iron ships, *quality for quality*, for the same money they would cost in England, or anywhere else. He says the idea that American ships cost more than English-built vessels, comes from the fact that when an American wants a vessel built, he gets a price from the shipbuilders on the Tyne for what is called "a tramp"—the very poorest sort of boat that can be turned out, and such as the best builders of England do not attempt to build. The price is 20 per cent. below what a first-class boat would cost here, and consequently it is said that ships can be built there just that much more cheaply. He also says the crack boats of the lines running between this country and Europe are not equal to boats that could be had in this country for the same money. The boats are owned abroad, and, therefore, foreign-built boats are naturally given the preference in buying, though boats could be had here that would run more economically and cost no more. A number of the Inman, Cunard, and White Star boats, built abroad at enormous expense, have either proved to be failures or enormous coal-eaters.

Mr. Cramp's remarks suggest the supposition that perhaps, one of these days, some of the crack transatlantic lines will be willing to try what American iron shipbuilders can do for them.

A Tribute to American Methods in Railroading.

Last month the mail train on the railway from St. Petersburg to Moscow was derailed while running at full speed. Occurrences of this kind in Russia are the subject of official inspection, and the report of the inspector who was ordered to investigate the matter has recently been made public. No one was injured, this fortunate result being due to the powerful action of the Westinghouse automatic brakes on the cars, which were of American pattern.

Ex-President Andrew D. White, speaking of Cornell University, says, in a recent letter:

When the University was projected there were many loose theories as to what should be done. Some thought that the endowment should be devoted to teaching youth the simplest branches of knowledge, without any preliminary examination. To this it was answered that such a course would simply duplicate what the public school system of the country already does far more cheaply, conveniently and accessibly. Again, some thought it ought to be devoted to teaching various simple trades and handicrafts. To this the answer was that the proper schools for all the simple trades and handicrafts, shoemaking, chairmaking, and the like, are the various workshops in those trades throughout the country. No other instruction in those branches can ever be so cheap, so effective, or brought so near the homes of the whole people. To have applied the endowment of the University to either of these purposes, would have been simply to waste it in doing badly what is already done well, and without producing any appreciable result upon either the liberal or practical education of the country.

Sixty weavers of Frankford, Philadelphia, have formed a company, rented a mill, bought looms, and in a few days will be in full running order under the name of the Frankford Co-operative Manufacturing Company. The capital stock is fixed at $20,000. The stock is divided into 400 shares, and there are at present sixty partners. The object of the company is to manufacture textile fabrics from cotton, woolen, silk, or linen, and to acquire lands and mill property, machinery, and all appliances necessary for carrying out the designs of the association. The by-laws are founded on those of the Sun Mill Company, of Oldham, England, one of the first co-operative factories ever started, and now owning a capital of some $250,000, and paying a dividend of 10 per cent. to its 10,000 shareholders.—*Textile Record.*

The *Mexican Financier* contradicts the stories going the rounds of the American press that owners and managers of Mexican "haciendas," and peon laborers there employed, refuse to order or permit the introduction of American agricultural machinery. It says every time a new machine placed on an hacienda demonstrates its value, owners of other estates begin to send in orders for similar machines, making it idle to assert that there is no market in that country for farming implements.

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NEW YORK, AUGUST 8, 1885.

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Employers and Employes.

Some instances that have recently been commented upon by English journals of the action of workmen toward the firms employing them, go to show that when we read of the bitter fights, strikes and lockouts that occur there between employers and employes, we only get one side, and that the dark side, of the story. Both sides in these controversies generally believe they are right, and use all honorable means to attain their respective ends. But with all the magnitude which strikes and lockouts assume in England, there is almost always a certain manliness in the fight, a disposition to give and take hard blows, if not cheerfully, at least good naturedly, that is sometimes entirely lacking in this country. And we think the relations between employers and employes more frequently show a bright side, altogether creditable to all parties there than here.

In one of the instances referred to, the workmen—numbering into the thousands—proposed to their employers that, in order to help them out in work that was not paying, they work a week without receiving any pay for it. This was not only fine in sentiment, but showed a willingness to render very material aid that could not help drawing all parties closer together.

In another instance, a shipbuilding firm began the construction of a vessel for which they had no order. It was apparently evident to the workmen in their employ that the firm's motive in doing this was, at least not entirely a selfish one, and not to be outdone, they proposed that on that particular vessel, the prices be reduced ten per cent., and further expressed a willingness to work two weeks without pay.

When relations between employers and employes are such as much exist in the two instances noted, there is not much danger of having to settle differences by strikes and lockouts. And such relations ought to exist there, here and everywhere, to a much greater extent than they do, and the parties, whether workmen or employers, who take the initiative in bringing this about, are the wisest and most sensible.

Human nature is substantially the same amongst civilized people without much reference to conditions in life, and the great majority of men are disposed to do as they are done by. No one likes to receive favors without a return in some way. It is not necessary to put the sentimental part to the front. As a mere matter of business, a better understanding between employers and employes, will pay both parties. Millions of dollars could be annually divided between them if this understanding was what it should be. The blame for controversy cannot be set down as against either side. Sometimes one, sometimes the other, and perhaps oftener both are in the wrong.

The two instances to which we have referred show that both parties sometimes have a fine sense of what is right, and that workmen are not disposed to be outdone in matters of justice and generosity.

We wish such instances might be multiplied.

Various trade journals are giving prominence to the fact that a ground edge is better than a forged one for a cutting tool, under the statement that "it is contrary to the old-fashioned notion." Where the idea came from that anyone ever thought differently, is not clear. The couplet:

> "Forge thick and grind thin,
> If a good edge you would win."

or words to that effect, is not, we believe, a recent production.

A Tribute to Practical Mechanics.

The editor of *The Engineer and Iron Trades Advertiser*, of Glasgow, referring to a recent editorial in the AMERICAN MACHINIST on "Science and the Steam Engine," concludes as follows:

The paper in question is written in reply to a young correspondent who stated in his letter that he had heard the steam engine spoken of as a towering monument that science had erected for industry, and wishing to know who the particular scientists were that took the lead in building up the structure alluded to. The editor in reply contends, in brief, that such personages are imaginary, and maintains that the numerous improvements which have been effected on the steam engine since Newcomen's time have originated with mechanics. With the sentiments of this contention we, after a long and careful study of the whole subject at issue, feel ourselves bound to acquiesce. There can be no doubt that certain modern scientists have, by lecture and otherwise, done much to explain and make transparent to the general reader the complex character of the different classes of steam engine in use at the present day. That is to say, they have contrived, with considerable success, to spread a knowledge of the subject, but for any writer to attempt to say that any single one of our scientific leaders has achieved any notable change or improvement in the way of applied mechanics, is to say that which cannot be borne out by facts. Whatever has been accomplished in this direction since the application of steam as a motive power was first tested, has, as our contemporary wisely contends, been effected by, or at least originated with, practical mechanics. To such we are indebted for the steam engine as it now is, and to such, and not to scientists, do we look for any improvements which may be effected thereon in the future.

Compressed Air Motor on a Surface Road.

On the Steinway & Hunter's Point Street Railway, terminating at the landing of the Ninety-second street, New York, ferry at Astoria, a car operated by compressed air has been running for some time, in a manner that appears to be very satisfactory. The power is got from a pair of cylinders 7½x14 inches, arranged locomotive fashion. The compressed air is carried in reservoirs occupying available space beneath the car, the reservoirs being of about 110 cubic feet capacity. These are charged with air of about 600 pounds pressure, and hold enough for a 10-mile trip; their capacity may be such as to provide for a trip of almost any desired length. Air of this pressure (600 pounds) is not used in the engine cylinders, the pressure being reduced by means of a reducing valve. This valve is so arranged that the reduction of pressure may be to any desired extent. In practice, air is admitted to the cylinders at sufficient pressure to be used at a high grade of expansion. Diagrams show the economical features of high initial and mean effective with low terminal pressure.

The air between the storage reservoirs and the engine is heated in a small boiler, about as large as a fair sized stove on the front platform, and burning about as much coal. It is not intended to make steam with this boiler, but simply to heat the water in it to a moderately high temperature—say 200° to 250°. Fire in this boiler, or heater, may be dispensed with by heating the water by a steam pipe when charging the air reservoirs. The air passes up from the reservoirs through this water, and occupies what would ordinarily be steam space in the boiler, in its passage receiving heat from the water. The pressure of air above the water is always sufficient to prevent vaporization of the latter.

The air, as it enters the cylinder, being hot, there is no trouble from freezing, which would be the case if it were not heated. Sufficient heat is added, we should judge from a casual inspection of the diagrams, to bring about very nearly isothermal expansion in the cylinders. In passing through the water the air is moistened, and the small amount of moisture taken up is converted into steam, which changes back to water during expansion of the air in the cylinders, giving up its latent heat to the air. This increase of heat enables the air to be expanded, as previously noted, isothermally, resulting in a material gain, as is well known. The moisture also avoids destructive dry heat in the cylinders, and provides for lubrication with oil, as in steam cylinders.

During a trip on this motor, in which we were permitted to examine its working, the boiler required no attention whatever, being supplied with a shovelful of coal before starting, and no coal supply being carried. The engines ran smoothly, and the car was instantly stopped and started, climbing the heavy grades on the road at several times the speed that could be accomplished with horses, and making the sharp curves without trouble. For stopping, a very efficient air brake is employed, which is noiseless in its operation, and if necessary the whole power of the engines reversed is used.

The general appearance of the whole is about the same as that of an ordinary street car. The operation of the engines is noiseless, no exhaust being heard. A very effective arrangement of valves is used, but the arrangement presents no complications in working, beyond that required to work any small link-motion engine. Cutting off is done by separate valves, while the links control the motion of the main valves. By these means short cut-off is had with large valve travel, instead of with short travel, as with the ordinary link motion, insuring full port opening without the usual early exhaust opening and closure.

The entire weight of the motor is about six tons, distributed on three pairs of wheels, a center bearing truck being used, the weight being equalized and properly distributed on all the wheels without reference to uneven track. In operation there seems to be plenty of adhesion, notwithstanding the argument sometimes used that such a motor would not have sufficient adhesion on a street track. Since the ability to stop a car drawn by horses or wire cable is dependent on the adhesion of the wheels, it is not easy to see upon what the argument in this respect against compressed air or steam on street roads is based. The usual appliances for using sand as with an ordinary locomotive are provided, but we believe they are seldom used.

There appears to be no trouble with the weight on the rails; in fact, we do not see why there should be any. On most street roads it would not be necessary to provide for so long a run as ten miles. When it is only necessary to provide for shorter runs, of course the weight of car and motor will be less, as the capacity of air reservoirs can be correspondingly less.

The motor was designed by Robert Hardie, and built for J. R. White, of 80 Beaver st., New York. Mr. Hardie has been for some time engaged in designing compressed air engines, one of which, for use on elevated roads, was illustrated in the AMERICAN MACHINIST about four years ago.

Homer Hamilton, of Youngstown, Ohio, has a son whom he tried to break into the machine business, but the young man wouldn't follow his father's footsteps. So Mr. G. E. Hamilton reversed the sage's maxim, "Go West, young man," came East, and became a caricature artist on *The Judge* and other comic illustrated papers. He doubtless makes as much money, and probably it is as well. Youngstown loses a machinist, but the country gains a first-rate funny man, and funny men are needed in this world, let croakers say what they will.

A correspondent would like to know from some practical foundryman of a cement, known from experience to be good, for filling small holes, such as sand holes, in castings. It is to be used on such castings as stove covers, and must stand fire. He has used a cement made of equal parts of gum Arabic, plaster of Paris and iron filings; also, for large holes, one made of plumbago and brimstone, but would like something better.

The confidence that is felt in hand manipulation is nowhere better shown than in the favor in which hand riveting is held. Without entering into any controversy as to the comparative merits of machine and hand riveting, it is plain that the confidence felt in the intelligence of men who drive rivets—in their ability to know the exact results of what they do—has delayed the introduction of machinery. Even if in the near future hand riveting shall be dispensed with in all places where machinery can be used, the delay will stand as a tribute to the worth of skilled workmen in holding their way so long against machinery.

The *Industrial World* says a Chicago machine shop is constructing a printing attachment for a tax-computing machine, the invention of H. B. Martin. If Mr. Martin wants to do something really notable, let him invent a tax-paying machine.

The Wichita Association of Stationary Engineers, of Wichita, Kansas, ask manufacturers to send them circulars, catalogues, or photographs of engines and pumps, also samples or descriptive circulars of engine appliances, believing that such favors from manufacturers will prove of material benefit. The members propose to recommend to their employers such goods as may meet with their approval, whenever employers are in need.

The *Southern Lumberman*, in illustrating a couple of machines built by a certain firm, starts out in this wise:

In presenting the illustrations in this article, we are conscious of the superiority of the machinery made by this firm over all other manufactured for the same purpose.

If this statement is well based, the *Lumberman's* readers have apparently about reached the point at which improvement is impossible, and further illustration unnecessary.

The news that "General Grant is dead," will strike a tender chord in the hearts of the men who fought against him, not less than those who faced death under his command. Americans everywhere, without distinction of section, party or race, have watched the old hero's last struggle, with sympathy and admiration. Now that the end has come, they will feel that one of the greatest and noblest of Americans, living or dead, has laid down his burdens and passed into history.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(229) **C. Sherbrooke, Canada, asks:** Will there be any difference in the pressure on a pump plunger in testing a boiler whether the connection is by ¾″ or ¼″ pipe? *A.*—The only difference will be in the friction of the water in the pipes. This will be greater in the smaller pipe.

(230) **R. B., Gleichen, N. W. T., asks:** Will or will not the addition of check valves to the tubing of a pump enable it to draw water higher than 32 feet? *A.*—The addition of check valves will not enable the pump to lift water any higher. A check valve well down may, by holding the charge, enable you to start the pump more readily.

(231) **P. H. M., Greenwich, Ohio, writes:** In answer to question 219 (July 25) you say F. K. U would probably need another eccentric if he puts a valve to cut off shorter in his engine. Would not his present eccentric work a longer valve by moving it on shaft to give the valve lead? *A.*—Our assumption was that after adding lap to the valve his present eccentric would not give sufficient travel to open the port.

(232) **H. A. S., Charlotte, Me., writes:** I have a furnace made of an old boiler shell, 32″ by 11½ feet, set in masonry, for warming a building. Since setting it I have bought an engine and boiler, and would like to make the furnace steam-tight so I can warm it by exhaust steam. If I secure the doors by bolts, and caulk all joints with a solution of chloride of ammonium, would I be likely to accomplish the object? or do you know of any better way? *A.*—Your job is one for a boilermaker. We do not think you will succeed in the way mentioned.

(233) **T. R., Trenton, N. J., asks:** Please give me a rule to determine the actual pressure per square inch of *section* in pipes. That is to say, what pressure will be exerted on one square inch of *surface* on a pipe 2½″ diameter, the internal pressure being 400 lbs., by gauge? *A.*—The pressure will be 400 lbs. on each square inch of exposed surface. The pressure operating to burst the pipe will be its diameter multiplied by the pressure per square inch, or, 2½×400=1,000. This will be resisted by two thicknesses of metal, one on each side. If the metal is, say, ¼″ thick, it will take 8 thicknesses to make one inch of sectional area, so 1,000×8=8,000 lbs. that must be held by two square inches of sectional area, or 4,000 lbs. per square inch of sectional area (not surface).

(234) **T. I. T., New Britain, Conn., asks:** 1. What is the best time to remove clinkers from the fire-brick of a furnace? *A.*—When you can get at them, which is generally when the furnace is cool. 2. What is the best method for testing a steam gauge? *A.*—Test it with a gauge known to be correct. 3. At what part of the boiler should the feed enter? *A.*—See American Machinist, March 31, 1885. 4. Which is safest for blow off, a cock or valve? *A.*—If properly constructed and arranged, either is safe. A straightway valve is very satisfactory. 4. What is the temperature of steam at 60 lbs. pressure? *A.*—60 lbs. gauge pressure, 310°. 5. What is meant by sea level? *A.*—The mean level of tide water. 6. What is meant by the temperature of steam at atmospheric pressure at the sea level? *A.*—About 212°.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis Pressure Regulator and St'm Trap, July 4, p 15

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies, Ferracute Mach. Co, Bridgeton, N J.

Steel Name Stamps, &c. J.B.Roney, Lynn, Mass.

See advertisement machine shop to let, etc., p. 10.

Consulting Engineer and Mechanical Expert, C. C. Hill, 84 Market st., Chicago, Ill.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st, New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Send for new catalogue of tools for amateurs; just out. Hartford Tool Co., Hartford, Conn.

Improved Labor-Saving Upright Drills; prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

Light, fine, interchangeable mach'y to order. Foot lathe catalogue for stamp. E.O.Chase, Newark, N.J.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Largest and best portable forge on the market, $10 each. American Tool Co., Cleveland, Ohio.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N.Y.

Universal grinders for lathe-centers, chucks, angles, or cylinders, C.C.Hill, 84 Market st., Chicago, Ill.

Treatise on gear teeth and bevel gears; specimen pp. free. Geo. B. Grant, 66 Beverly st., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Farley's Reference Directory of the Machinists', Iron, Steel and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the Am. Machinist each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

Manufactures.

Brunswick, Me., people talk of establishing water works.

P. D. Barker will erect a cotton compress at Birmingham, Ala.

The Fireless Engine Co., New Orleans, La., will build machine shops.

Works are to be erected at Plano, Ill., by the Chicago Steel-Wheel Works.

Hegewald & Co., New Albany, Ind., will erect boiler and sheet iron works.

Shelbyville, Ill., is to have water-works, to be completed by January 1, 1886.

T. B. Mullen will establish a new foundry and machine shop at Lexington, Va.

The Coleman Cotton Cleaner Co., will erect a factory at Grand Rapids, Mich.

The South Boston Iron Works have begun the manufacture of paper mill machinery.

The Bryden Forged Horseshoe Co., Catasauqua, Pa., will add additional machinery.

The towns of Bristol, Tenn., and Goodson, Va., propose erecting joint water-works.

The Vulcan Iron Works, of St. Louis, will resume operations August 1, on a large scale.

The Buckeye Buggy Co., Columbus, Ohio, is preparing to build a six-story factory.

The Harvey Paper Co., Wellsburg, W. Va., has been organized to manufacture paper.

The Coweta Fertilizer Co. has been organized at Newnan, Ga. H. C. Arnall is president.

It is said that Iron ore of a very superior character has been discovered in Llano County, Texas.

The Mellert Foundry and Machine Co., Reading, Pa., are preparing to erect extensive buildings.

The Glendon Iron Works, Easton, Pa., are likely to erect works for the manufacture of wrought iron.

The Cleghorn Mills, Fitchburg, Mass., will be a four-story structure, 160x60, and will make dress goods.

The New Albany (Ind.) Woolen Mill Co. is completing a new factory building and ordering machinery.

The Henderson Cotton Mills Co., Henderson, Ky., has been incorporated for the manufacture of cotton goods.

E. Van Winkle & Co. are erecting a large factory at Atlanta, Ga., to build cotton presses and ginning machinery.

The Union Manufacturing Company's machine shops at Battle Creek, Mich., are now running 14 hours a day.

George P. Lies, 313 E. 17th street, New York, is erecting a 5-story factory at corner of Avenue A and 80th street.

Z. Thompson, Jr., carriage manufacturer, Portland, Me., will soon put in a new engine and additional machinery.

Wm. Woerle, 704 Hancock street, Brooklyn, N.Y., will erect a 2-story brick factory on Hancock street near Reid avenue.

G. W. Knox, Starke, Fla., has given five acres of land as a site for the shops of the Blue Spring, Orange City & Atlantic R. R.

Wm. J. Mathison, 20 Cedar street, New York City, is building a two-story factory on 12th street near 3d avenue, Brooklyn.

The Bowdoin Paper Mfg. Co., Topsham, Me, intend building a mammoth new paper mill, and are looking about for a location.

Wm. Burrowes, Portland, Me., will build a steam mill this fall, having rooms to let with power for wood-turning and other work.

Everson & Co. ask the people of Scottdale, Pa., to subscribe to a fund to establish a partially co-operative rolling mill in that town.

Franklin Ward, Rockford, Ill., now in the foundry business, has bought land on which he will erect foundry and machine shops.

A. J. Bates & Co., 202 Church street, New York, will erect, in Brooklyn, a 3½-story factory 150x40 feet, with boiler and engine houses.

Eugene Doherty, corner N. 9th and 2d streets, will erect a 3-story India-rubber factory at corner of 1st and N. 8th streets, Brooklyn, N. Y.

Rufus Hammond has bought the Bangs Brothers' chair factory at Cortland, N. Y., and will begin the manufacture of grain separators at once.

Woodcock's Foundry, Bridgeport, Conn., was sold recently at Sheriff's sale, to James Lewis; business will be resumed at an early day.

The *Mexican Financier* calls the attention of cotton growers in that country to the manufacture of cotton seed oil to replace the imported article.

The Blevney Mfg. Co., of Newark, N. J., has received a gold medal of the first-class for their friction clutches from the New Orleans Exhibition.

The Lowell Card Clothing Co., Lowell, Mass., which has been running on reduced time for some part of the past year, has recently resumed full time.

O. W. Davis, Jr., Bangor, Me., will be general manager of a new company organized to rebuild and operate the Katahdin furnace; work to begin at once.

Fire caused a loss of $200,000 at the New York & New England R. R. Co.'s car shops at Norwood, Mass., on July 19, including a large amount of valuable machinery.

The Leesburg, Fla., *News* is the authority for the statement that the Florida Southern Railroad will put up extensive repair shops within the Y at the west end of that city.

Wilhelmina Juck, 401 E. 106th street, New York, (builder being W. A. Juck, 321 E. 106th street), is putting up a factory for sash and blind work on 104th street near 1st avenue.

The expert appointed to examine the State Iron Works, at Rusk Penitentiary (Texas), reports favorably on the State's resuming its operations, which will probably be done.

The works of the Wells & French Car and Bridge Co, Chicago, were entirely destroyed by fire on July 20, the loss aggregating $150,000, including a large amount of valuable machinery.

According to *The Engineering and Mining Journal*, a company has recently been organized in Paris to mine copper in the Peninsula of Lower California. The company will start with a large plant.

Rev. M. C. O'Brien, Bangor, Me., is prepared to offer liberal inducements in the way of building sites to any individuals or concerns desiring to start industries new to Bangor.—*Industrial Journal.*

The Birmingham (Ala.) Stove Co. has been incorporated by G.W.C. Lomb & Co., with a capital stock of $15,000. Stoves, ranges and heaters will be manfactured as soon as a site can be secured and works built.

The Charleston (W. Va.) Iron Fence and Machine Works have begun operations, using the machinery of the Buffalo Forge Co. They will make several patterns of wrought fence, and do general repairs in machine work.

Prof. F. L. Bartlett has purchased all the machinery, ores and coal belonging to the Portland (Me.) Smelting and Reduction Works, and is making important additions and improvements. The works will soon be in full operation.

The Syracuse *Herald*, of July 20, says the Central Company are negotiating for the purchase of the Post sewing machine building at Batavia, and ten acres of land, for their palace and sleeping car works now situated at Schenectady.

The Elliott Machine Co., Newton, Mass., has issued a circular of the Elliott Pamphlet Stitching Machine. The circular is unique in matter and arrangement, and illustrates the work done by this very ingeniously constructed machine.

The McDonald Machine Co. was recently organized in Portland, Me, with $300,000 capital stock. D. B. Bennett, president; Geo. L. Warren, treasurer. W. R. McDonald is the inventor of the engine and the friction ratchet-drill, which the company will manufacture.—*Industrial Journal.*

Thomas F. Rowland, of the Continental Works, Brooklyn, N. Y., has obtained the exclusive right for the manufacture of the Pontifex Ammonia Absorption Machine for the United States and South America. He has constructed three of these machines, and has several more nearly completed.

The Lenhardt Engine Company is the name of a newly organized corporation of Detroit, Mich., with a capital of $25,000, the object of which is the manufacture and sale of a patent steam engine pump, the invention of Mr. George Lenhardt, the well known sewing machine agent at Detroit.—*U. S. Sewing Machine Times.*

The Gadsden Water-Works Company has been incorporated in Gadsden, Ala., by A. L. Glenn, president; Samuel H. Toby, vice-president; G. E. Fuller, secretary, and W. G. Brockaway, treasurer, to build water-works. Capital stock, $60,000. H. G. Comegys and J. Ensign Fuller, of New York, are the contractors.—*The Sanitary Engineer.*

The Fairfield (Me.) *Journal* says that town presents a fine opening for a first-class machine shop and foundry, as there is no town on the Kennebec running so much machinery as Fairfield, and most of the manufactories there, and in Somerset, have to go abroad for repairs and machinery. It also says a manufactory of doors, sash and blinds could do well there.

During the latter portion of last year the Bowdoin Paper Company, of Topsham (Me.), cut down the pay of their employes, the reduction being about ten per cent. Recently the company decided not only to restore the old wages but to refund their money which had been withheld, and within the past few days the various employes have been paid this sum. *The Bangor (Me.) Industrial Journal.*

Frank Danks writes us: "Two brothers and myself have just started a machine shop and foundry in Arkansas City, Cowley County, Kansas. We have a stone shop 30x90 feet, well supplied with tools to do a general machine business. Thinking the shop would not be complete without a copy of the American Machinist, I enclose the price of one year's subscription." The firm name is Danks Brothers, engineers and machinists.

The Fishkill Landing Machine Co., Fishkill-on-the-Hudson, N. Y, are now building Corliss engines for the following parties: Ginna & Co., No. 110 Reade street, New York, one 125-H. P. for their factory in Hubert street; D. Appleton & Co, No. 3 Bond st., New York, one 90-H. P. for their printing house at Brooklyn; Lewis Tompkins, Fishkill Landing, N. Y., one 60 H. P. for Hudson Straw Works; Wm. D. Budd, one 60-H. P. for his brick yard at Dutchess Junction. They have recently furnished engines and boilers to John C. Berney, at Matteawan, N.Y., and William M. Cary, at Fishkill, N. Y.

It will be gratifying news to the people of Troy to learn that all of the stock, $2,500,000, for the reorganization of the Albany and Rensselaer Iron and Steel Company has been subscribed. The company, of which Chester Griswold will probably be president, will get down to business without delay, and it is expected that within a few weeks work on the blast furnaces which will be erected on Braker Island will be inaugurated. This new company comes at a critical time in the history of the iron and steel industry of Troy, and if it succeeds in competing successfully with similar corporations in Scranton and other cities of Pennsylvania, there will be great rejoicing here.—*Troy Standard.*

The Betts Machine Co., Wilmington, Del., have issued a new card price-list of hardened steel mandrels, ground with a uniform taper from end to end, and strongly recommended as a means of saving time and expense in every shop.

S. T. Wellman, superintendent Otis Iron and Steel Co., of Cleveland, writes us; "I see by your issue of July 18 that the Standard Steel Casting Co., of Thurlow, Pa., have made what they believe is the largest steel casting yet attempted in this country, weighing 22,000 lbs. About a year ago we made for our own use a pair of steel rolls weighing, each, when finished, 31,000 lbs. The charge in the furnace for each weighed 42,000 lbs. They turned up as perfect as any iron roll could be made. Besides the above, we have made several steel castings which weighed in the rough from 30,000 to 34,000 lbs. Some one in this country may have made a heavier casting in steel, but the Standard must certainly try again."

Machinists' Supplies and Iron.

New York, July 23, 1885.

There are no new features in the supply trade. The complaint is not so much against the amount of business as against the small profit at which it must be done. Small orders are the rule, and this increases the cost of handling goods. Until buyers are satisfied that bottom prices are reached this way of buying may be expected. Manufacturers have the same complaint to make against dealers, viz.: That they order in exceptionally small lots.

Iron—Transactions indicate that the consumption of American pig remains about constant. No. 1 Foundry is held firm at quoted prices, the supply on hand being moderate. Standard brands have sold at $17.50 to $18. No. 2 Foundry is not held so firmly; competition is sharp, and prices favor buyers. We quote prices $15.50 to $16; Grey Forge, at furnace, $13.50 to $14.50, with sales slow.

Scotch Pig has ruled dull, with but few sales of small lots. Concessions from asking prices are generally secured by buyers. We quote Shotts, $19.50 to $20; Coltness, $19.50 to $20; Glengarnock, $18.50 to $19; Gartsherrie, $19.50; Summerlee, $19 to $19.25; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $19.50 to $20; Dalmellington, $18 to $18.25.

Copper—There has been no improvement in the demand for ingot. The London market is a little easier. Lake is held at 11⅛c.; other brands at 10¼c. to 10⅝c., but buyers are bidding less, with prospects favoring them.

Lead—The market is slack, neither dealers nor consumers showing much inclination to buy. Asking prices are 4.10c. to 4.15c., but less is bid.

Tin—The market has been firmer, and a strong tendency to advance prices is shown. We quote jobbing lots of Banca 22c. to 22¼c.; Straits and Malacca, 22¾c. to 23⅛c.

Antimony—Hallett's, 8.50c.; Cookson's, 9½c., with fairly active trade.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Position wanted as foundry foreman; good references M. E Chanic, Am. Machinist.

Wanted—Situation as foundry supt. or foreman. Best reference. Address Founder, Am. Machinist.

Wanted—Competent brass moulder. Address with reference and experience, George Kratz Evansville, Ind.

Mech. draftsman, with long experience in marine engineering, desires engagement. Address "Marine," Am. Machinist.

Practical man desires steady employment on tools, jigs, engines, or general repair work. Address J.T.U., Am. Machinist.

A thoroughly practical mech. engineer, designer and draftsman is open for engagement; specialty, steam engineering; also well posted in other lines. Address U., Am. Machinist.

The Ottumwa Iron Works, of Ottumwa, Iowa, wish to engage a foreman for their foundry, to take charge of about 25 moulders; castings to be made are mostly such as are used in mining machinery

Engineer, machinist, and steam fitter, of long experience, with $500 to place, desires good place as above, where he can draw interest from money; best references. Address C., Am. Machinist.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 35 cents per line, each insertion.

The Crescent Steel Tube Scraper is king. Crescent Mfg. Co., Cleveland, Ohio.

To make room for larger tool, will sell cheap, for cash, a planer 42"x42"x12', in good order. Address P. O. Box 2085, Bridgeport, Conn.

For Sale, Cheap—Five lathes, 10" swing, 3' bed; adapted for fine work; in use one year; countershaft and chuck with each. Address M. E. F., care Am. Machinist.

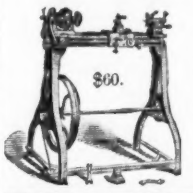
For Sale—A patent safety valve and alarm for steam boilers. Parties only meaning business need apply. Call on or address Railing & May, P. O. Box 160, Mechanicsburg, Pa.

A Manufacturing Co., with the best facilities for doing foundry and machine work of medium weight, would like to correspond with parties who require such work. Address X., Am. Machinist.

CHANDLER & FARQUHAR,

177 & 179 Washington St.,

BOSTON, MASS.



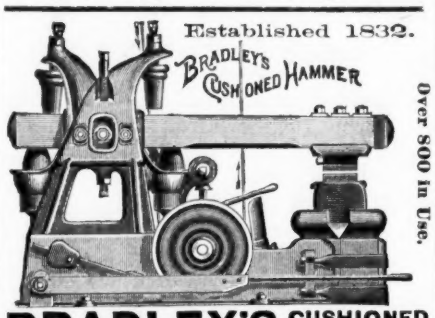
TOOLS AND SUPPLIES

—FOR—

Machinists, Plumbers, Gas Fitters, Electricians, Model Makers, Roller Skate Makers, Amateurs, etc.

Send for Catalogue B.

Established 1832.



Over 800 in Use.

BRADLEY'S CUSHIONED HAMMER.

Stands to-day without an Equal.

It approaches nearer the action of the Smith's Arm than any Hammer in the WORLD.

SPECIAL NOTICE.

All parties making, selling or using an Upright or Helve Power Hammer having a Cushioned Vibrating Saddle, infringe our patents, and we shall hold them legally liable for the same.

BRADLEY & COMPANY, Syracuse, N. Y.

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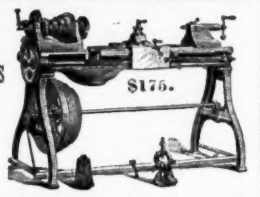

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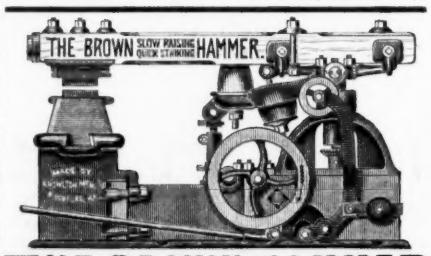

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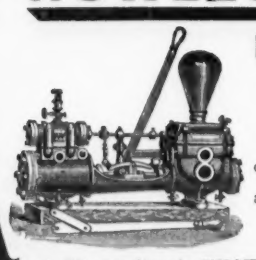

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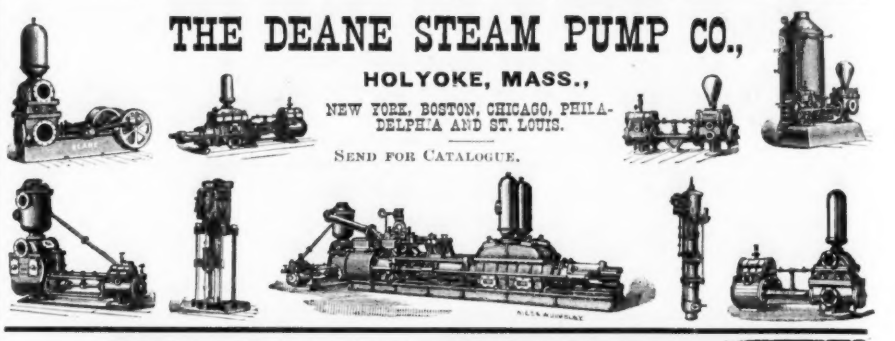

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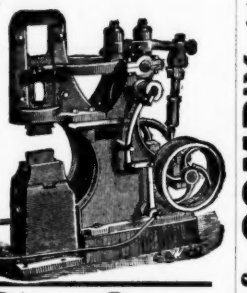

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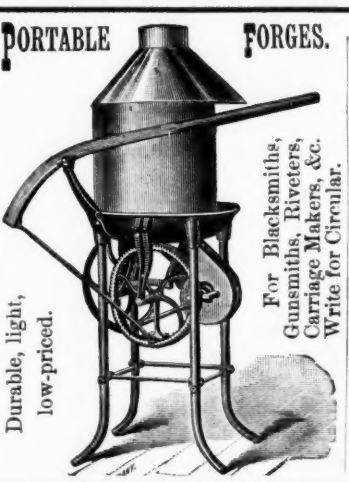

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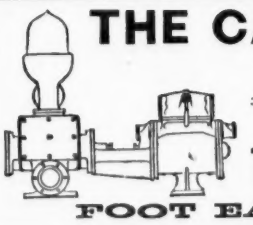

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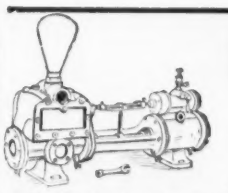

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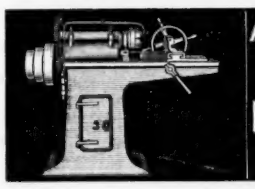

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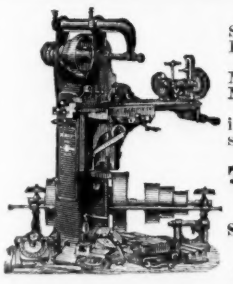

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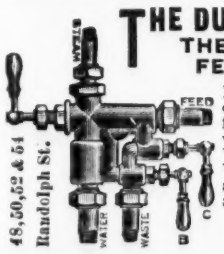

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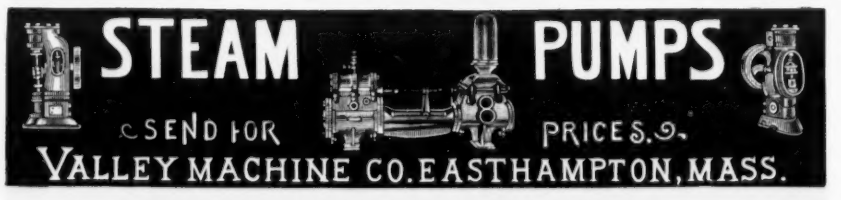

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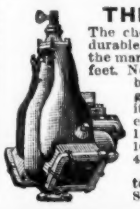

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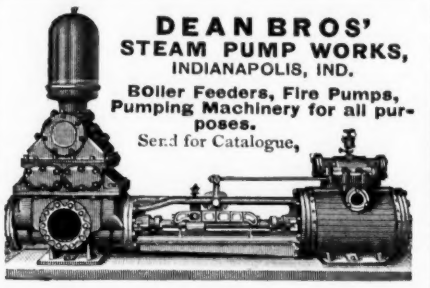

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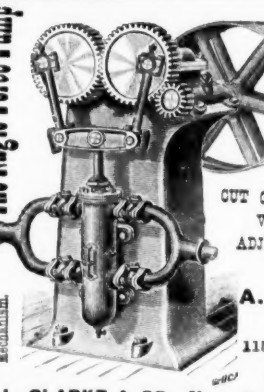

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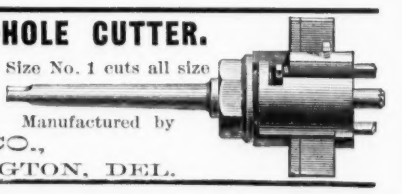

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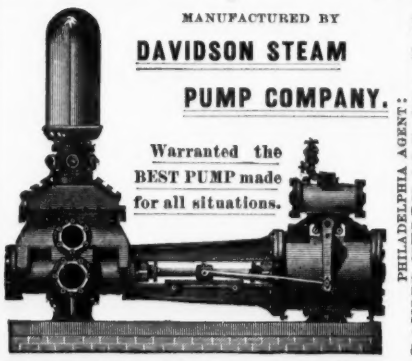

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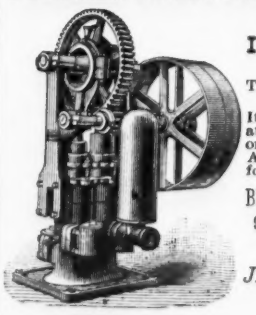

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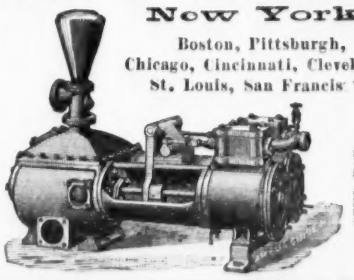

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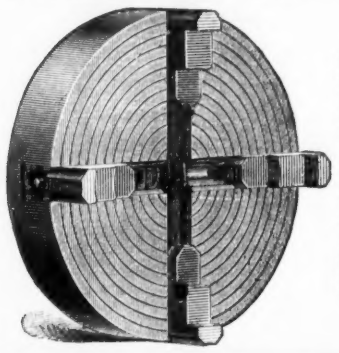

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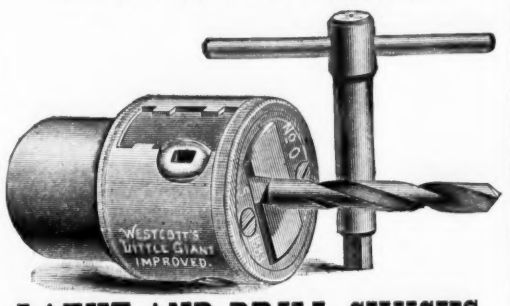

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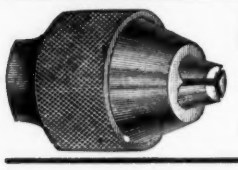

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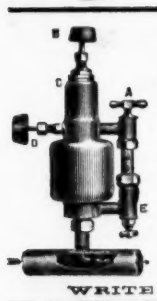

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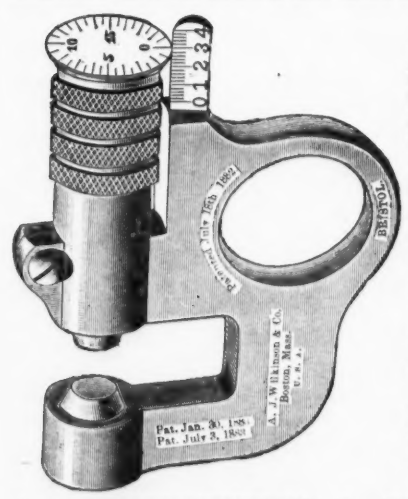

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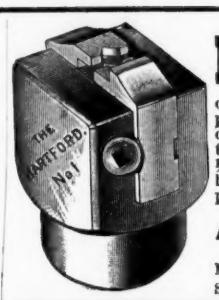

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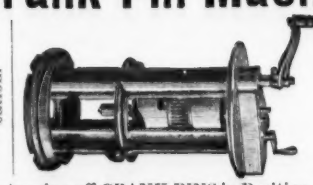

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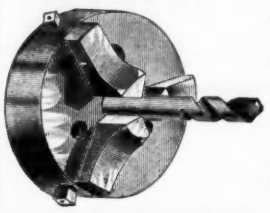

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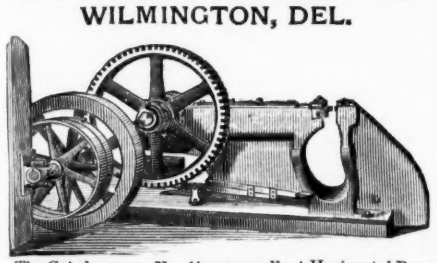

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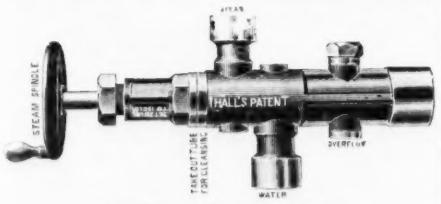

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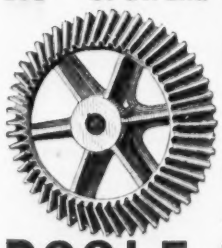

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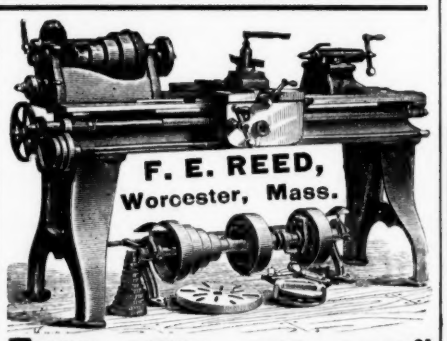

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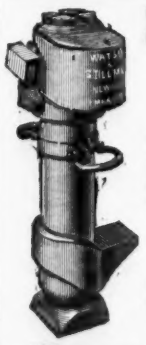

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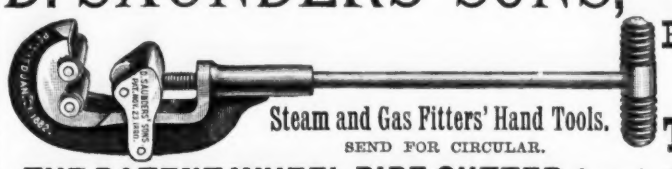

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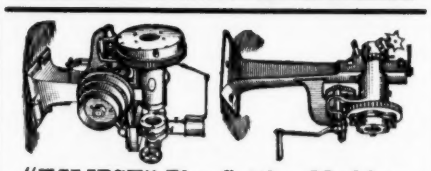

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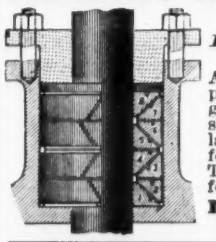

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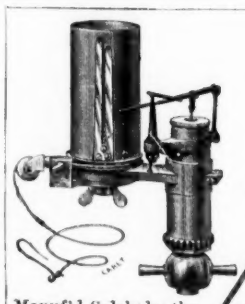

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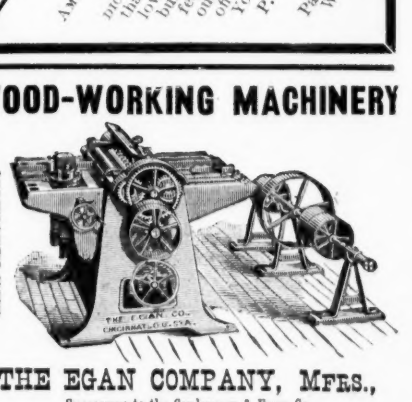

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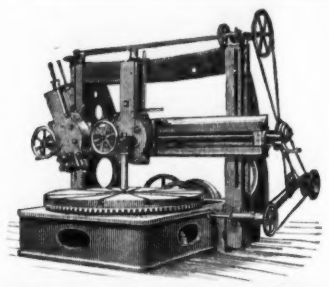

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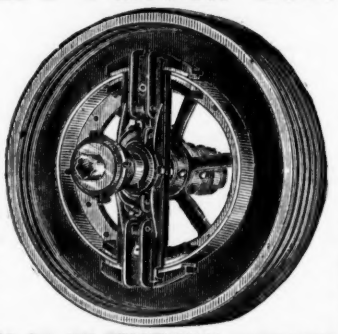

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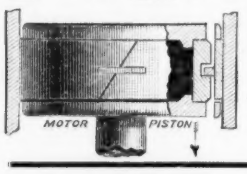

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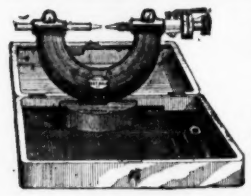

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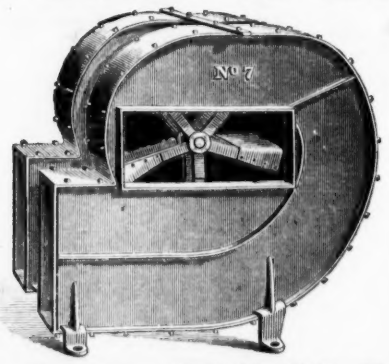

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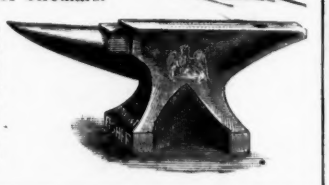

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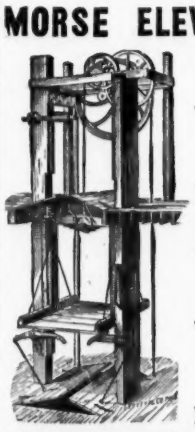

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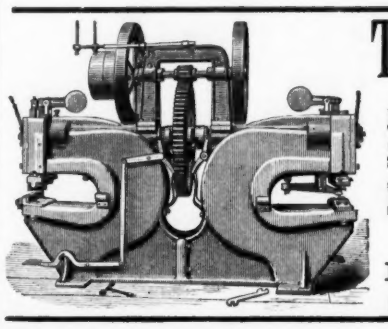

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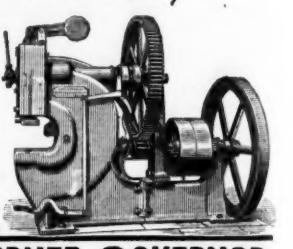

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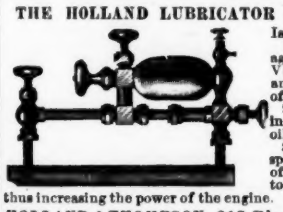

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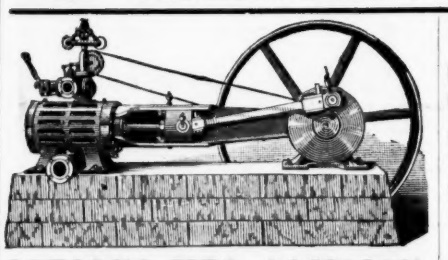

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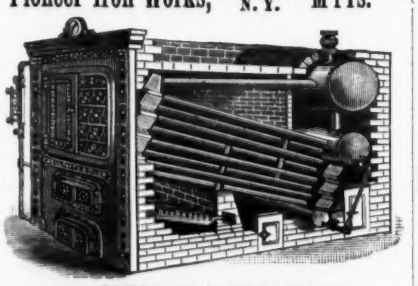

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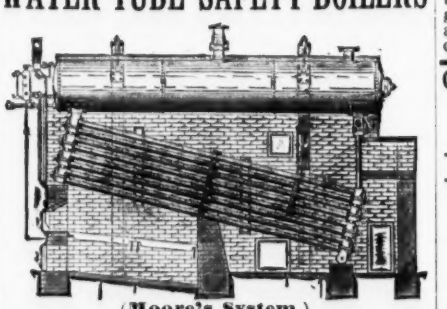

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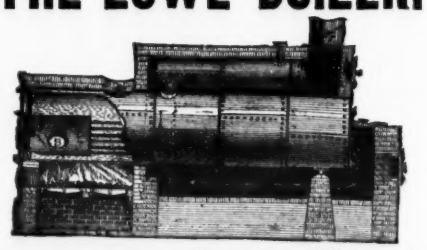

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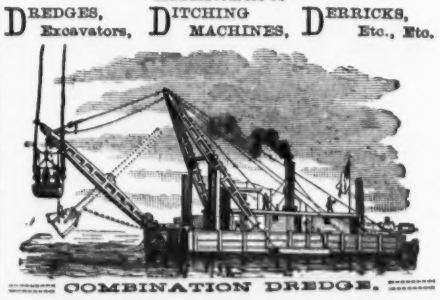

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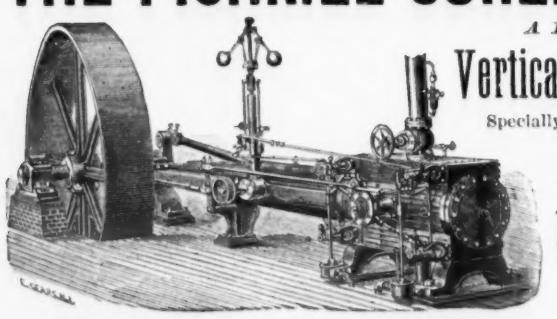

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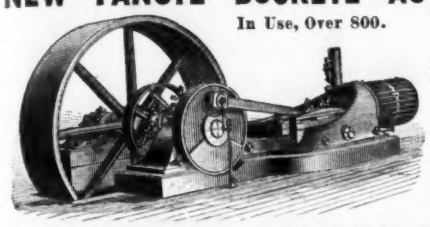

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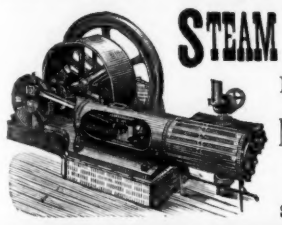

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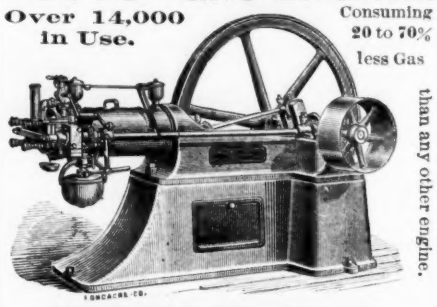

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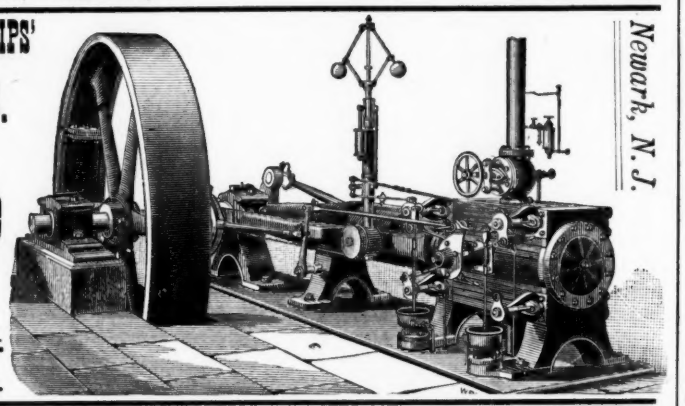

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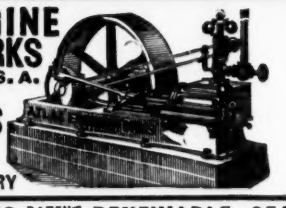

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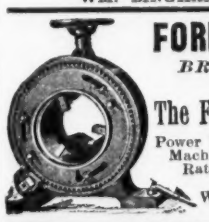

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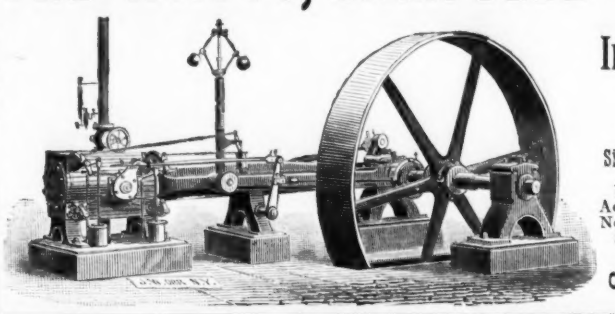

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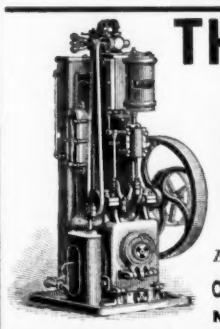

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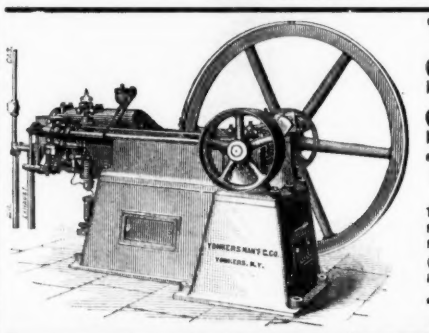

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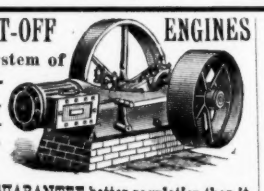

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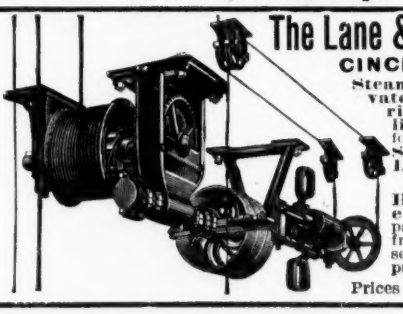

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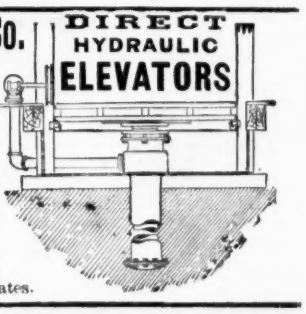

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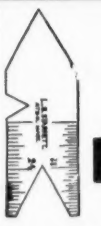

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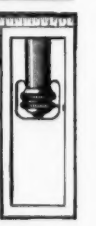

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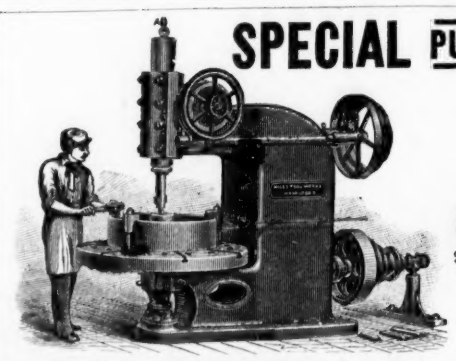

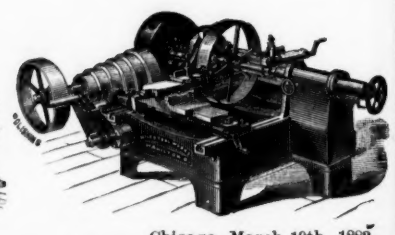

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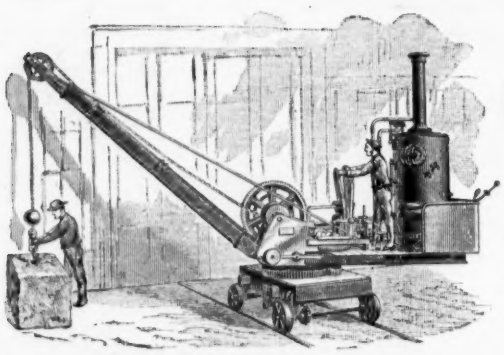

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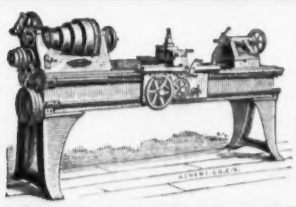

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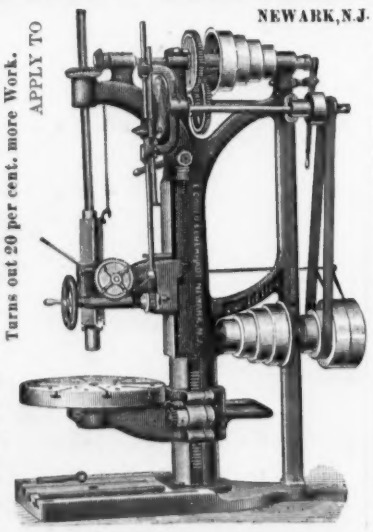

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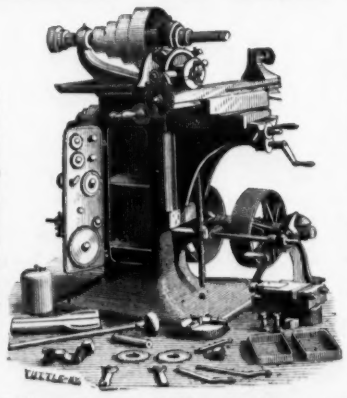

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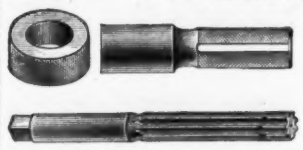

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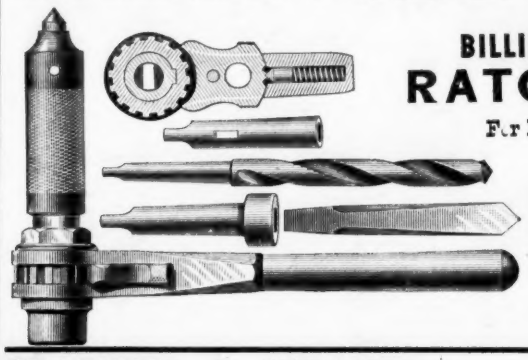

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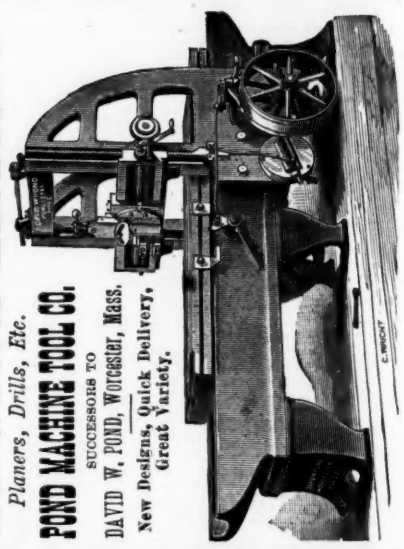

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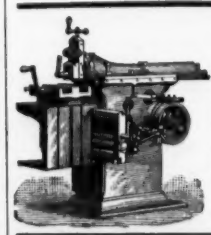

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